AIR CONDITIONING HEATING AND VENTILATING

OCTOBER 1959

For the Engineer
Engaged in DESIGN
APPLICATION
ESTIMATING
SPECIFICATION
and LAYOUT

One of the spectacular presentations that are part of the twentieth edition of Ice Capades which is now touring as an indoor ice skating rink show. Photo © Ice Capades. For details on design and costs of ice skating rinks, see page 77.

IN THIS ISSUE

Design and Costs of Ice Skating Rinks 77
Refrigerant Suction Line Piping 61
Data Sheet—Air Conditioning Estimating Guide 89
Radiation Fallout Shelter Design 70
Detail Sheet—Water Heater Hookups 91
How Laundries Can Reclaim Waste Heat 93
New Uses for Evaporative Cooling 64
Heating an Airplane Hangar 67
BHC Seeks Large-Building Market 98
New Equipment 104
New Literature 128
Ad Digest 157

FEATURES . . .

of the WATTS T&P RELIEF VALVES

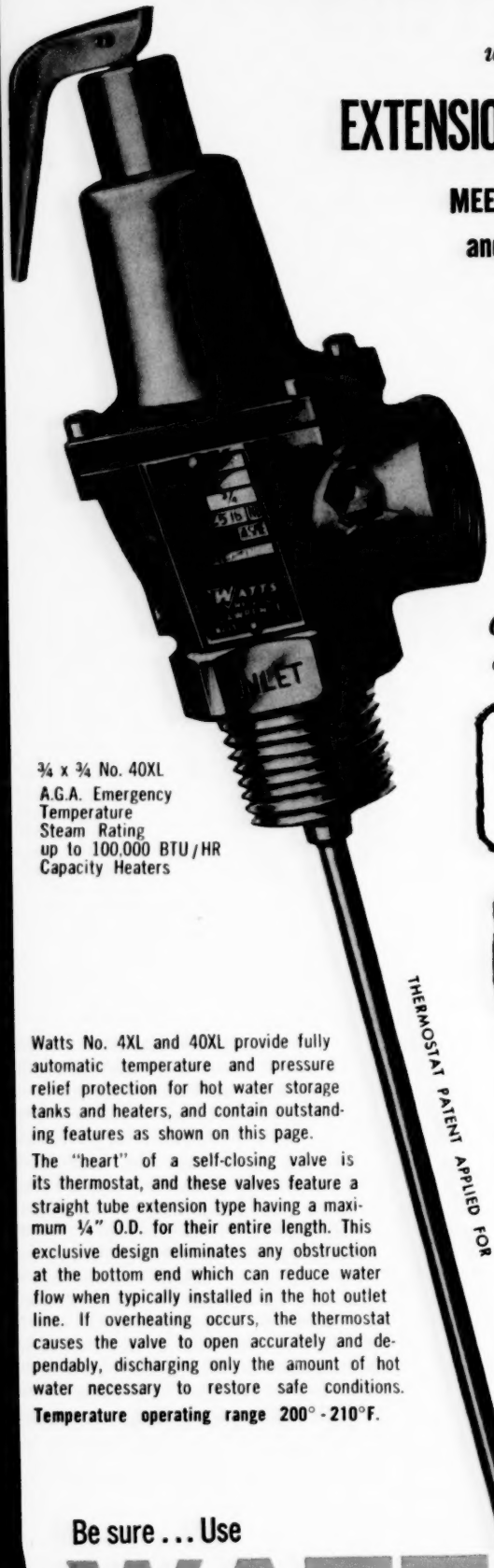
with the EXCLUSIVE STRAIGHT TUBE

EXTENSION THERMOSTAT DESIGN

MEETS NEW 1959 F.H.A. REQUIREMENTS and A.S.A. CONSTRUCTION STANDARDS

Leading authorities agree that an **extension type thermostat** in temperature (and pressure) relief valves is essential to the **complete** protection of hot water supply systems. As a matter of fact, they are **required** by both the new A.S.A. Standard Z21.22-1958 and the new F.H.A. Minimum Property Standards for temperature relief valves installed in the hot outlet piping from storage water heaters.

Compare these superior features with any other valve on the market today.



¾ x ¾ No. 40XL
A.G.A. Emergency
Temperature
Steam Rating
up to 100,000 BTU/HR
Capacity Heaters

SOLID WALL, HYDRAULIC PRINCIPLE, PISTON TYPE THERMOSTAT, NOT VULNERABLE TO FATIGUE OR CORROSIVE WATER CONDITIONS, ASSURES DEPENDABILITY AND LONG LIFE.

DOES NOT START TO OPEN VALVE UNTIL TANK TEMPERATURE EXCEEDS 200°F AND FULLY OPENS BEFORE 210°F.

STRAIGHT TUBE EXTENSION THERMOSTAT, WITH MAXIMUM ¼" O.D. FOR ITS ENTIRE LENGTH, DOES NOT RESTRICT FLOW IN HOT OUTLET LINE.

MOTIVATED BY HYDRAULIC FLUID ACTION THROUGHOUT ITS ENTIRE LENGTH — DOES NOT NECESSITATE "PUSH RODS" — OPERATION NOT AFFECTED IF BENT ACCIDENTALLY.

TEMPERATURE SENSING ZONE

¾ x ¾ No. 4XL
A.G.A. Emergency
Temperature
Steam Rating
up to 50,000 BTU/HR
Capacity Heaters

Watts No. 4XL and 40XL provide fully automatic temperature and pressure relief protection for hot water storage tanks and heaters, and contain outstanding features as shown on this page.

The "heart" of a self-closing valve is its thermostat, and these valves feature a straight tube extension type having a maximum ¼" O.D. for their entire length. This exclusive design eliminates any obstruction at the bottom end which can reduce water flow when typically installed in the hot outlet line. If overheating occurs, the thermostat causes the valve to open accurately and dependably, discharging only the amount of hot water necessary to restore safe conditions.

Temperature operating range 200° - 210°F.

Get the straight facts. Send for "What's What at Watts" Bulletin

Be sure . . . Use

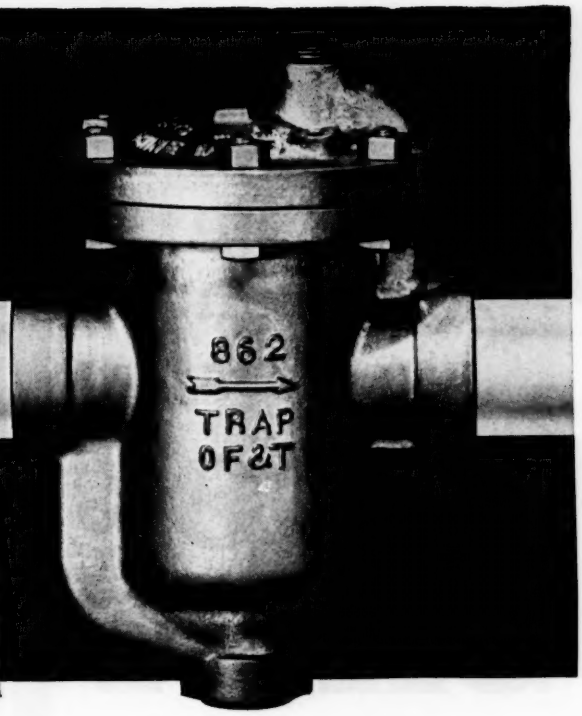
WATTS

Protection and Control Specialties

Watts Regulator Company, Lawrence, Mass.

Here are the steam traps designed especially for heating systems . . .

ARMSTRONG OPEN FLOAT AND THERMOSTATIC STEAM TRAPS



Engineered for low pressure intermittent service where large amounts of air accumulate while steam is off

Armstrong O.F.&T. Traps make it possible for heating systems to deliver the efficiency they were designed to deliver. They are ideal for low pressure unit heaters, pipe coils and standing radiation.

Advantages to the user:

BIG AIR HANDLING CAPACITY—Thermic vent handles large amounts of air in system when steam is turned on. Fixed vent handles normal air in system.

NO STEAM LOSS—Stainless steel valve is water sealed, is not damaged by dirt or scale, cannot develop steam leaks.

CONDENSATE AND AIR REMOVED AT STEAM TEMPERATURE—No opening lag.

LONG LIFE—All working parts, including open float, are stainless steel. Bodies and caps designed for 250 psig operation. Open float cannot collapse.

MINIMUM MAINTENANCE—Simple, proved design and high quality materials assure trouble-free service.

Advantages to the contractor:

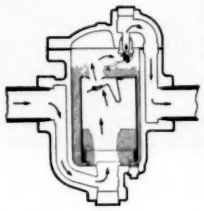
LOW COST—Mass production methods permit high quality at low cost.

EASY INSTALLATION—Horizontal, straight-through pipe connections, conventional sizes.

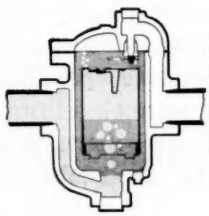
MINIMUM CALL-BACKS—Nothing to stick or clog. Unaffected by ordinary dirt.

UNCONDITIONALLY GUARANTEED TO SATISFY THE USER.

HOW ARMSTRONG O. F. & T. TRAPS WORK:



When steam is turned on, it pushes air through the wide open thermic vent and trap discharge valve at full differential pressure between supply and return lines. Condensate formed by incoming steam goes right through.



As steam reaches open float, thermostatic vent closes. Float fills with steam and rises to close trap valve. Residual air and CO_2 escape through fixed vent at steam temperature.

BULLETIN NO. 775 BULLETIN NO. 801

Use the coupon at right to get these helpful bulletins: No. 775 describes O.F.&T. traps fully. No. 801 tells how to select traps for draining unit heaters including data on 30 makes of unit heaters.

ARMSTRONG MACHINE WORKS
8464 Maple St. • Three Rivers, Mich.

Armstrong Machine Works
8464 Maple St., Three Rivers, Mich.

Please send me: ☐ O.F.&T. Trap Bulletin No. 775; ☐ Unit Heater Bulletin No. 801.

Name.....

Company.....

Address.....

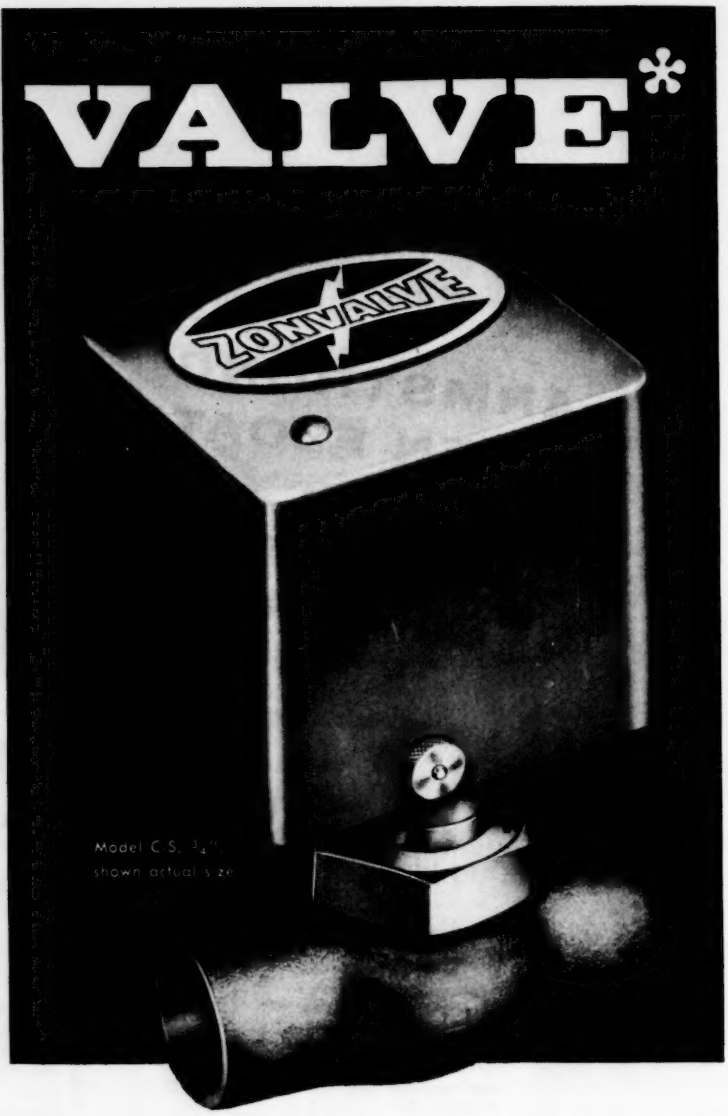
City.....Zone.....State.....

ZONVALVE*

the zone control valve with

100% SHUT OFF

for positive temperature control!



Globe-type construction of Zonvalve guarantees complete shut-off on steam, hot and chilled water systems. This means positive temperature control, without heat waste.

Engineer-architects and heating men recognize the superiority of Zonvalve's design features. Self-aligning plug insures positive closure and eliminates jamming. Valve is powered by a heavy-duty motor, with pinion, gear and cam assembly—for extra-long life and silent, dependable operation. Zonvalve's "hand-size" compactness makes installation possible where space is limited. Zonvalve is the *only* valve that uses Teflon for a self-lubricating, permanent seal.

Zonvalve is competitively priced. Built to last a lifetime, *it is the only zone control valve with an unconditional written Five-Year Guarantee!*

Zonvalve is ideal for modernization and new construction, in residential, commercial and industrial zone heating. For the finest in zone control equipment—specify Zonvalve, install Zonvalve!

New color brochure contains layouts, applications, customer benefits, technical data and prices. Write for Brochure D-10.

ZONVALVE

* This Trade-Mark is registered by Heat-Timer Corp., manufacturers of heating controls and motorized valves since 1939. It is your guarantee of positive zone control.

ZONVALVE MODELS

RS-A C-S S-S

AVAILABLE IN SIZES FROM ¾" TO 1¼"

HEAT-TIMER CORP.
657 BROADWAY, NEW YORK 12, N.Y.

AIR CONDITIONING HEATING AND VENTILATING

Volume 56, Number 10 October, 1959

EDITORIAL STAFF

EDITOR
Clifford Strock

ASSOCIATE EDITORS
Nathan N. Wolpert
William B. Foxhall
Harold M. Englund
Richard L. Koral

ADVERTISING REPRESENTATIVES

NEW YORK
Harry J. Twine
R. E. McLoughlin
93 Worth Street
CAnal 6-8120

CLEVELAND
Edward B. McEntee
17115 Hillsboro Rd.
IVanhoe 1-6857

CHICAGO
George G. Turner
Peter B. Impasto
228 N. LaSalle St.
FInancial 6-6864

BIRMINGHAM
Fred W. Smith
1201 Forest View Lane
TRemont 1-5762

DALLAS
Richard B. Hoierman
9006 Capri Drive
DAvis 7-3630

LOS ANGELES
Whaley Simpson Co.
6608 Selma Ave.

SAN FRANCISCO
Whaley Simpson Co.
700 Montgomery Bldg.

EXECUTIVE OFFICERS

PRESIDENT
Robert B. Luchars

VICE PRESIDENT-TREASURER
Edgar A. Becker

SECRETARY-PUBLISHING MGR.
Harold L. Gray

AIR CONDITIONING, HEATING AND VENTILATING is published monthly by The Industrial Press, 93 Worth Street, New York 13, N. Y. Executive, editorial and subscription offices, 93 Worth Street, New York 13, N. Y. • Entered as second-class matter August 31, 1956 at the Post Office, East Stroudsburg, Pa., under Act of March 3, 1879. • Subscription rates: In the United States and Canada, one year, $3; two years, $5; three years, $6; in Mexico, Central America and South America, one year, $4; two years, $7; three years, $8; in all other countries, one year, $7; two years, $12; three years, $14. Single copies, 50c. • Copyright 1959, by The Industrial Press. Permission required to reproduce articles. • Contents of AIR CONDITIONING, HEATING AND VENTILATING are indexed monthly by Industrial Arts Index and microfilmed by University Microfilms, Ann Arbor, Mich. • Member: National Business Publications, Business Publications Audit of Circulation, Inc., Society of Business Magazine Editors.

REFRIGERATION

Refrigerant Suction Line Piping 61
First of series on refrigerant circuit components.....J. R. Harnish

AIR CONDITIONING

New Use for Evaporative Cooling 64
Analysis shows its use for cooling hot spots.....R. S. Ash

HEATING

Heating for Flight Test Facility 67
Special problems are created by hangar doors and snow.....F. J. Turnbull

FALLOUT SHELTERS

Minimum Design Standards for Radiation Fallout Shelters 70
Design considerations and recommendations .....R. B. Panero

COAL FIRING

The Status of Spreader Stokers 76
Pros and cons, with suggestions for successful operation.

REFRIGERATION

Reference Section—Design and Cost Data for Ice Rinks 77
Valuable information for the design engineer .....M. J. Williams

ESTIMATING

Data Sheet—Air Conditioning and Refrigeration Estimating Guide 89
Guide data for quick assessment of proposed installations.

PIPING

Detail Sheet—Hookups for Storage Water Heaters 91
Water heater connections; leaching cesspool details.

LAUNDRIES

Waste Heat Reclamation for Laundries 93
Design, selection and installation of reclamation equipment....J. J. Coleman

HEATING-COOLING

You Will Be Hearing from BHC 98
Hydronic industry moves into commercial-industrial promotion.

DEPARTMENTS

High Spots in the News 4
Washington Overtones—L. Overman 6
News of the Month 12
Scientific Frontiers 16
Picture Paragraphs 69
Piping and Plumbing—L. Blendermann 100
New Equipment and Materials 104
New Literature 128
Briefly Stated News Items .. 138
Book Reviews 150
Coming Events 152
Index to Advertisers 153
Ad-Digest 157

HIGH SPOTS

A Commercial and Industrial Division of the Better Heating-Cooling Council has been formed for the promotion of hydronic (wet) systems in the larger type building. With the enthusiastic backing of manufacturers and mechanical contractors, the new Division will be contacting many readers of this magazine in the months to come. For details, see "You Will Be Hearing from BHC" in this issue, an interview with Henry M. Gibb, Division spokesman, by the editors of ACH&V, page 98.

How to cope with the deluge of building science research literature currently published throughout the world will be considered at the Fall Conference of the Building Research Institute, to be held in Washington, D.C., November 17-19. Charles H. Topping, DuPont Company, BRI past president, will head up the sessions to review the documentation and cataloging of this constantly growing store of information, to the end that this new knowledge may be more conveniently available. For further information on the Conference, which includes sessions on **new methods for heating buildings,** see News of the Month, on page 12.

Preliminary details of the ASHRAE Semiannual Meeting, to be held February 1-4, in Dallas, Tex., in conjunction with the 2nd Southwest Heating and Air-Conditioning Exposition have been mailed out to members of the Society. There will be technical sessions on absorption refrigeration, heating, thermoelectric refrigeration, sound, and heat transfer. Conferences on the use of plastics in domestic refrigerators, on commercial refrigeration, fenestration, window air conditioners, and automotive air conditioning are announced.

The Exposition, in Memorial Auditorium, will be open from noon until ten o'clock each day of the meeting; the Baker Hotel will serve as ASHRAE headquarters. For those who plan to attend, the Society urges the placement of room reservations as soon as possible.

The ASHRAE fund raising campaign—$250,000 as its part toward the $10 million United Engineering Center—gets under way October 1. On that day, too, ground will be broken adjacent to the United Nations Building in New York City for the 18-story Center which will bring under one roof virtually all major American engineering societies, with superior facilities for coordinated activities, information sources, and library reference facilities. According to the ASHRAE-UEC Committee, every engineer should give according to his ability, which varies with the rewards that engineering has afforded him.

The average American home, properly insulated and designed, can be heated and air conditioned for as little as $8.44 a month in the South, and $14.60 a month in the North, first results of a national testing program conducted by Owens-Corning Fiberglas indicate. Costs are based on a 1200-sq ft house and are actual costs incurred in heating and cooling 70 of 116 houses used in the test program. Cost per month for heating in the northern states should not exceed $18.20 with "FHA minimum insulation".

A first National Electric House Heating Exposition is announced. It is to be held at the Sherman Hotel in Chicago on March 21, 22, and 23. Sponsor is the Electric House Heating Equipment Section, National Electrical Manufacturers Association, New York, N. Y. Products displayed will include direct resistance heating equipment, zone type and central heat pump systems, insulation, and electrical controls for heating equipment. General chairman is Stanley B. Aronson, sales manager, Berko Electric Mfg. Corp., Queens Village, N. Y.; C. F. Kreiser, general sales manager, Edwin L. Wiegand Co., Pittsburgh, Pa., is chairman of the Section.

CHICAGO SUN-TIMES

Naess & Murphy
Architects-Engineers

Field Enterprises, Inc.
Owners

George A. Fuller Company
General Contractors

William A. Pope Company
Refrigeration Contractors

Kroeschell Engineering Co.
Heating Contractors

New completely air conditioned building ... last word in comfort and efficiency

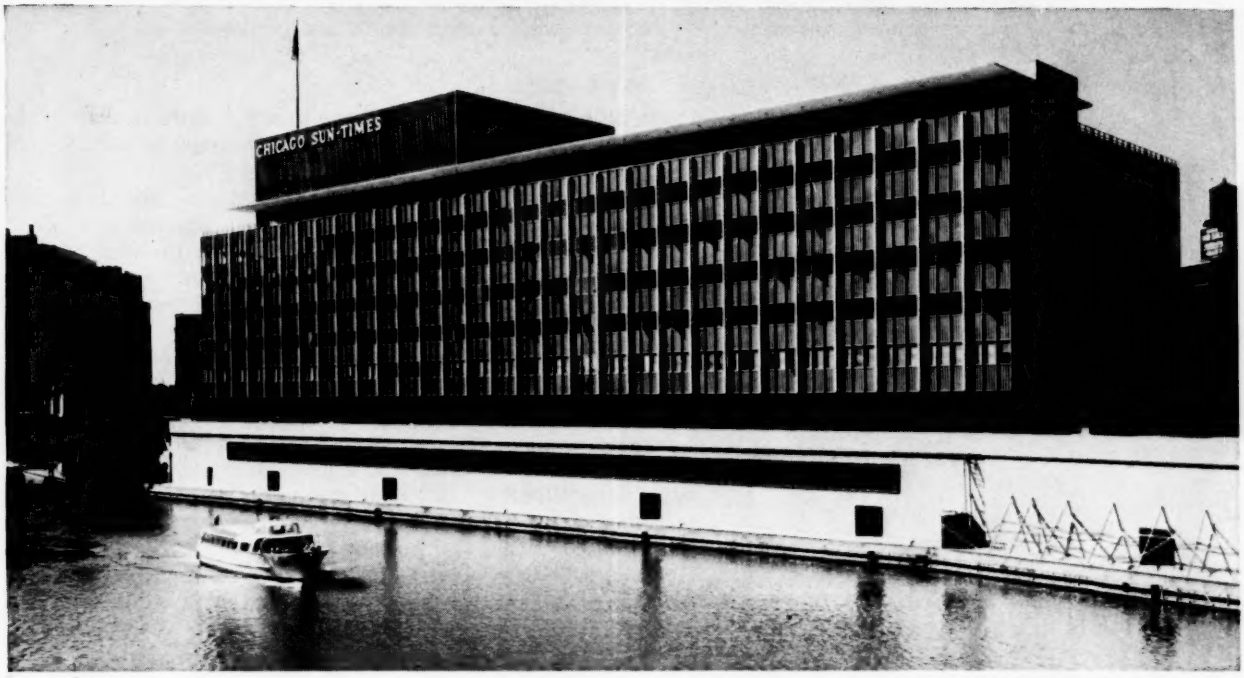
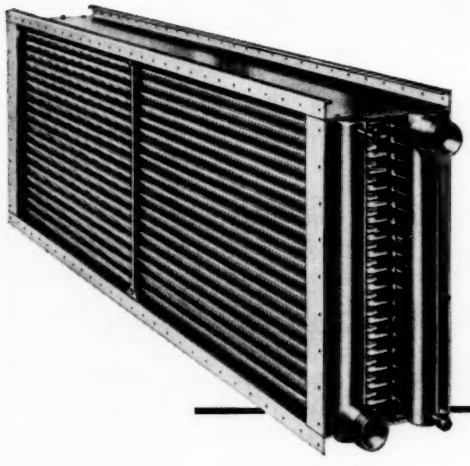


Photo: Hedrich-Blessing, Chicago

AEROFIN INSTALLED



Aerofin's modern SMOOTH FIN design permits use of high air velocities without turbulence or excessive resistance — provides ample heat-exchange capacity in limited space.

You can safely specify Aerofin coils at full published ratings. Aerofin performance data are laboratory and field proved by the pioneers in light-weight extended surface.

AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N. Y.

Aerofin is sold only by manufacturers of fan system apparatus. List on request.

ENGINEERING OFFICES IN PRINCIPAL CITIES

WASHINGTON OVERTONES

by LORING F. OVERMAN

● A customary overtone after a Congress adjourns is the idea that in spite of a lot of talk, there really wasn't much action. Nothing could be further from the truth.

For example, during the recent session of the 86th Congress, the Senate met on 138 days for a total of 1080 hours, 45 minutes.

During that time 1,030 measures were passed, almost one per hour.

Of them, 254 became law.

● The reason Congress gets little credit for many of the things it does is that only the controversial issues make the headlines. Others—each important to some group or individual—attract little attention.

Following are some of the actions of concern to heating, ventilating and air conditioning people. Those bearing the "PL" designation had been enacted into law at presstime; the others were awaiting acceptance or a veto by the President:

(PL 86-257) to protect union members from racketeering; to guard against collusion by management, and to curtail certain types of picketing and secondary boycotts.

(S 2654) compromise housing bill providing, principally, extension of FHA mortgage loan authority; $650 million for urban renewal (slum clearance); $50 million of housing loans for the elderly (new program); and $25 million special assistance for cooperative housing.

(HR 8678) a cent-a-gallon increase in gas tax to continue interstate highway systems providing gateway to new "suburbia", fabulous outlet for heating, ventilating and air-conditioning equipment and services.

(PL 86-73) authorizes $100,000,000 veterans' housing program.

(PL 86-50) provides $165,400,000 for 43 new atomic energy projects.

(PL 86-149) authorizes total of $1,225,525,000 for construction at military bases, here and abroad.

(HR 7476) extends duration of Federal Air Pollution Control Act from 1960 to 1964, increasing annual appropriations from $5 million to $7.5 million.

(S 2524) signed into law by President Eisenhower, bars a state from taxing orders for tangible personal property where the only activity of the seller within the state is the solicitation of such orders, which are sent outside the state for acceptance or disapproval, and if accepted, filled by shipment from outside the state.

● Veto of HR 6596, which would have set up an independent Coal Research and Development Commission, is proving to sound an unpleasant overtone for the coal industry.

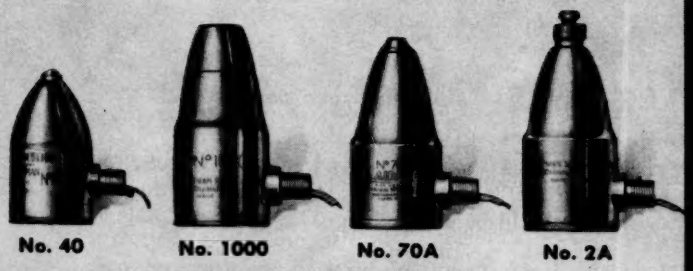
A spokesman for the National Coal Association considered the veto a "serious setback, since coal research would provide a cushion for the economic impact that will come as our oil and gas supplies diminish."

● In vetoing HR 6596, the President may have had in mind the possibility that an energy resources hearing scheduled for October 12-16 might clarify the question of coal and its relation to other energy producers.

Rep. Wright Patman, (D-Tex.), chairman of the Congressional Joint Economic Subcommittee on Automation and Energy Resources, indicated the hearings will be unusually broad in scope.

Special attention will be given, he said, to the over-all prospective requirements for energy, and to the outlook for supplying the need through commercial production and through such possible future sources as nuclear and solar power.

(Continued on page 8)



RADIATOR STEAM VENTS

MAIN STEAM VENTS

WATER VENTS

CONVECTOR STEAM VENTS

THERMOSTATIC STEAM VALVE

AIR VALVE

HOFFMAN *Complete line of* VENTING VALVES

For every steam and hot water heating system—residential, institutional, industrial—Hoffman Specialty Mfg. Corp. makes the *correct* Vent Valve *for each specific requirement*. This wide range of Vent Valves is another example of the complete *quality line* of Hoffman Specialties. Whenever you need valves, pumps, traps, strainers, etc., think of Hoffman . . . write for further information.

HOFFMAN SPECIALTY MFG. CORP. 1700 WEST 10th STREET • INDIANAPOLIS 7, INDIANA

VALVES, TRAPS, VACUUM AND CONDENSATION PUMPS, FORCED HOT WATER HEATING SYSTEMS, STOCKED AND SOLD BY LEADING WHOLESALERS OF HEATING AND PLUMBING EQUIPMENT.

WASHINGTON OVERTONES *(Continued from page 6)*

Government and industry spokesmen will devote five days to a study of requirements, analyses of coal, oil and electrical sources, and to developments in the solar and nuclear fields. An entire day will be devoted to each category.

● Wendell Barnes, Administrator of the Small Business Administration, has announced that his agency made 238 loans in August for a total of $11,272,000, compared with 586 loans in August of 1958. Since the start of its financial assistance program to small business, the agency has approved 17,146 loans totalling $808,517,000.

● The Office of Civil and Defense Mobilization has issued two supplements to its national plan for defense against nuclear attack.

Supplement No. 36, entitled "Research and Development", may be of possible interest to heating and ventilating people. The document proposes serious research in such fields as shelters and protective construction, protective service equipment, and methods of emergency repair of vital utilities.

Annex No. 7 outlines the role of the military in the event of nuclear attack.

Copies of the publication are available from the Office of Civil and Defense Mobilization, Washington 25, D.C.

● Signing by the President of Housing Bill No. 3 may authorize FHA to expand its mortgaging activities, but making the money actually available may require other measures.

Present indications are that 5¼% interest (plus ½% for insurance) will not be sufficient to lure funds out of hiding. Many observers feel that another advance in FHA interest rates is in the offing. Builders report considerable difficulty in lining up advance commitments for funds to be needed next Spring.

● The Washington headquarters of Air-Conditioning and Refrigeration Institute is busy with many things these days:

—Program for its 11th Annual Exposition is nearing completion, with prominent speakers scheduled to discuss timely topics in Atlantic City, November 2-5. The food supply, residential air-conditioning, industrial and commercial systems—all will be represented by conference speakers.

—ARI has announced publication of its first standard for refrigeration units designed for use in refrigerating trucks and trailers. The new standard covers "Speed-Governed Units Employing Forced Circulation Air-Coolers". Work is continuing on a second standard, covering hydraulic-drive and other types of variable speed units.

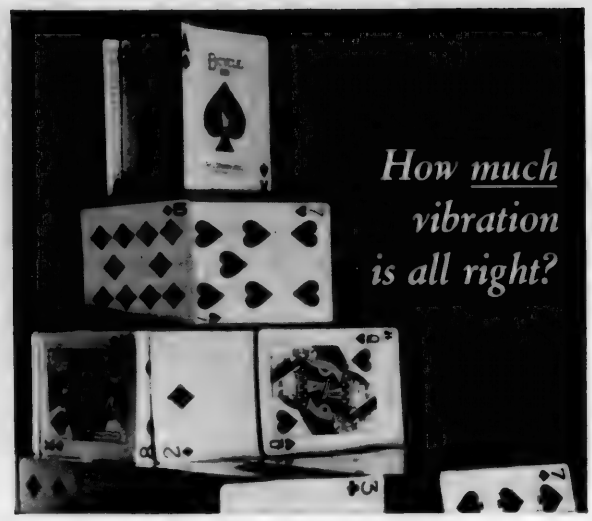
—ARI Secretary George S. Jones Jr., announces the appointment of Warren L. Bouve to the newly created position of Secretary, ARI Product Section of the Institute.

● Summaries of studies in 21 phases of refrigeration research are included in the 1958 Annual Report of the Refrigeration Research Foundation, 12 North Meade Avenue, Colorado Springs, Colo.

● With some 50 speakers, 80 to 90 workshop participants, and more than 30 panel discussion members, the Building Research Institute will stage on November 17 to 19 the largest multi-stage conference in its history at the Shoreham Hotel, Washington, D.C. Names that read like a "Who's Who in Building Science" stud a program that will encompass six of the most important subjects concerning the building industry and its related professions as they gird for the building boom of the 1960's.

Among the "hottest" of the program topics will be "New Heating Techniques for Buildings", under the chairmanship of John Everetts, Jr., consulting engineer, Charles S. Leopold, Engineers. Other topics: sandwich panel design, modular building standards, and new developments in metal curtain walls.

How much vibration is all right?

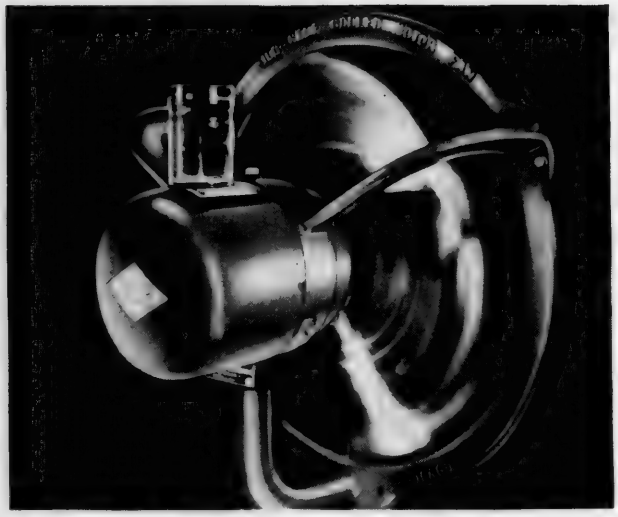


When it's ventilating equipment...

When *you* specify ventilating equipment, what do *you* consider most important? What features do *you* insist on? What contributes most to the quality of equipment *you* want?

To nail down these answers for us, an independent research organization conducted a nationwide survey among consulting mechanical engineers.

Here's how ILG fans and motors stay vibration-free



Full Speed Ahead — and still not a ripple in the water. With Ilg direct-connected propeller fans you get operation as *vibration-free* as it's possible to be. Ilg's "One-Name-Plate" pledge of performance covers *both* the dynamically balanced, patented Type "Q" fan wheel and the permanently lubricated, self-cooled motor.

Ready with the Rotor! All rotating *parts* in Ilg-built motors are checked for static and dynamic balance. After final assembly, Ilg Motors undergo additional checks. Smooth, *vibration-free* operation assures long life—and a quiet one—for *all* Ilg Motors.

Checks and Balances. Ilg Centrifugal Fan Wheels—with Backward Curved (BC) Blades and Airfoil design—have to "check out" before being direct-connected to 3-phase or permanent-split capacitor, single-phase Ilg-built motors.

For fans built to satisfy your "specs"...

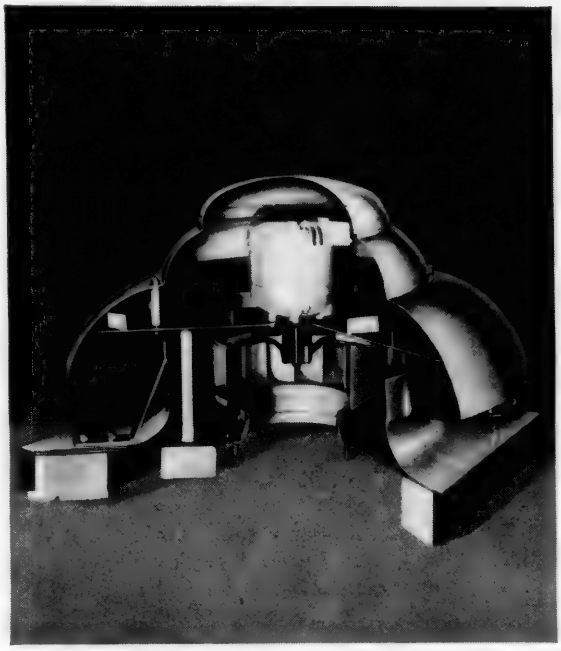
consulting engineers vote for vibration-free fans on 9 ballots out of 10

Results of the poll? Nine times out of ten *vibration-free operation* ranks foremost among those who specify fans and ventilating equipment.

As shown below, Ilg Fans and Ventilators are as *vibration-free* as it's possible to be. But that's only *one* reason why it pays to choose Ilg. Not to be overlooked are these additional points preferred by consulting engineers: minimum maintenance, low operating costs, ease of repair, quietness.

For further details of why Ilg rates so high with those who specify, send for Catalog No. 153 on propeller fans, Bulletin No. 257 on Airfoil centrifugals, Bulletins 2301 and 2700 on power roof ventilators.

ILG *power roof ventilators cost less to operate*



Look Under the Hood of this Ilg Power Roof Ventilator and you'll see why it's such a popular purchase. Ilg Backward Curved Aluminum Airfoil Centrifugal Fans assure smooth, quiet air flow and low shock loss. Permanently lubricated, self-cooled, direct-connected Ilg Motors eliminate belt maintenance, friction losses, slippage.

David and Goliath? Just name the exhaust or supply propeller fan power roof ventilator that fits your capacity and kind-of-building needs—and Ilg has it. 11 different sizes, all direct-connected fan and motor for quiet, *vibration-free* operation and low maintenance. All components dynamically balanced for lifetime alignment.

specify ILG

ILG ELECTRIC VENTILATING COMPANY
2851 N. Pulaski Road, Chicago 41, Ill.
Offices in 57 Principal Cities
Member of Air Moving and Conditioning Association, Inc. (AMCA)

NEWS OF THE MONTH

SURVEY

shows 96% of new Manhattan apartment houses are air conditioned. Central systems gain.

Air conditioning of new apartment houses in Manhattan, New York City, a rarity only five years ago, is today included in new buildings almost without exception.

This is the conclusion of a survey of postwar apartments made by Frank Hudik, president of Hudik-Ross, Inc., mechanical contractor, which points up the remarkable speed with which air conditioning has caught on as standard equipment in modern, privately-constructed residential buildings.

The study, which included both rental and cooperative apartments, revealed that of fifty-eight structures completed this year or now under way, 96% have air conditioning. Fifty-one are equipped with through-the-wall units, five have central systems and only two contain no cooling equipment although they do provide special air conditioning outlets.

As recently as 1955, Mr. Hudik states, only three of thirteen buildings completed that year had air conditioning equipment. It was a year later that the influence of air conditioning first made itself felt. In 1956, of thirty-seven buildings surveyed, twenty had the built-in individual units, with the remainder containing outlets.

Although it was the in-wall unit that gave air conditioning its great impetus in apartment houses, substantial gains have also been made in central cooling systems, according to Mr. Hudik. The development of the individual unit which made air conditioning standard equipment has actually spurred builders to improve their cooling systems, and the only way to improve individual units is to provide the more advantageous and more expensive central systems.

The in-wall unit gained almost immediate popularity when it was introduced. The elimination of window units which projected haphazardly and marred the appearance of the building facade was welcomed by both tenants and owners. In addition the in-wall units were virtually flush with the wall and did not interfere with furniture arrangement or draperies nor with the opening or closing of windows.

But, Mr. Hudik notes, the survey indicates there is a definite trend today toward central systems. He points out that whereas only six buildings erected in the twelve-year period from 1947 to 1958 were centrally cooled, five buildings completed this year or now under construction have central systems.

According to the contractor, complete air conditioning can only be accomplished by means of a central system. The air flow from an individual unit can come only from the direction of the exterior wall where the unit is located, and can in fact cool only an area which has an exterior wall. A central system, on the other hand, provides a better and more even air distribution throughout, and can cool interior areas which often are in most need of cooling, such as foyers, halls, kitchens and baths.

From the point of view of the owner, although the initial expense for central air conditioning is greater, he is concerned with maintaining only one plant instead of 300 to 500 separate in-wall units contained in an average building.

CONFERENCE SESSION HIGHLIGHTS ARI SHOW

Ziel of Albert Kahn to discuss criteria for selection of proper equipment in industrial and commercial air conditioning jobs.

A Conference Session will be a new feature at ARI's 11th Exposition of the Air-Conditioning and Refrigeration Industry, scheduled November 2-5 at Convention Hall, Atlantic City, N. J.

H. E. Ziel, an associate of Albert Kahn Associated Engineers and Architects, Detroit, Mich., is one of several Conference Session speakers already announced. Other speakers include Harold J. Humphrey, president of the National Association of Frozen Food Packers, and Arthur S. Goldman, director of market research for *House & Home*.

Mr. Ziel's discussion will deal with commercial and industrial air conditioning, including criteria for selection of the proper equipment for each specific job, and reasons why industrial and commercial concerns decide to air condition the spaces in which their employees work. Mr. Humphrey will discuss the relationship between refrigeration and the nation's food supply. Mr. Goldman's talk will center on residential air conditioning.

Another Conference speaker, Joseph Rorick, assistant for planning and construction of International Business Machines, will appear as the representative of a large industrial user of air conditioning. IBM's concern for air conditioning is not only for its own office and production efficiencies, but to produce the required ambient temperature and humidity conditions without which some of its principal products could not function.

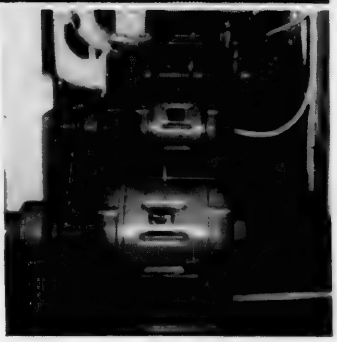
Exposition chairman R. H. Luscombe reports that the Defense Department is planning a display at the Show depicting the many vital uses the Armed Forces have for refrigeration and air conditioning.

The Exposition will be preceded by a day-long meeting of the Air Conditioning and Refrigeration Institute membership at Haddon Hall in the same city. At least three allied groups plan meetings during the Show.

The Refrigeration Service Engineers Society will hold its 22nd Annual Convention at the Ambassador Hotel from October 30 to November 2. The National Commercial Refrigerator Sales Association will hold its 13th Annual Convention at the Traymore Hotel on November 1, 2 and 3. The Annual Convention of the Air-Conditioning and Refrigeration Wholesalers is planned for November 1 and 2 at the Shelburne Hotel.

(More news on page 14)

Home Security Life Insurance Company Building, Durham, N.C., is equipped with B&G Universal Pumps. "The pumps couldn't be any quieter," says the plant engineer.



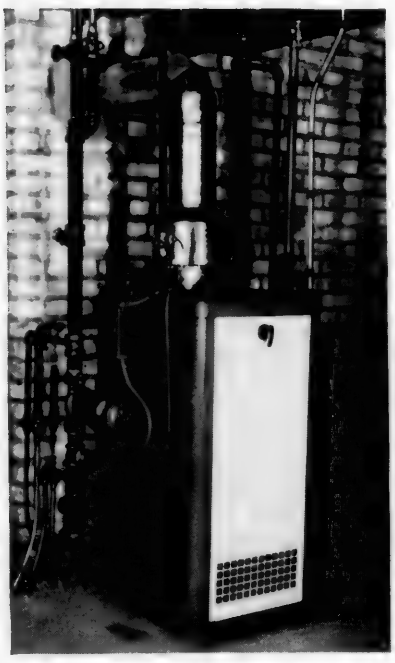
B&G® BOOSTER AND UNIVERSAL PUMPS

quiet... where silence counts

Whether for residential or commercial applications of a forced hot water system, *quiet* operation of the circulating equipment is essential. A noise-creating pump can be a headache and a profit-wrecker for all concerned—architect, engineer, contractor and owner. That's why men responsible for pump selection are concentrating on B&G Boosters and Universals—for the simple reason that they will not be plagued later with noise complaints.

Since the manufacture of its first heating pump, B&G has been conscious of the need for silent, vibrationless operation. Today, B&G pumps have reached a peak of perfection—they are incredibly quiet—need no flexible connections or vibration eliminators. From B&G-built motors to B&G-developed, harder-than-glass "Remite" leak-proof seals, these pumps are *specialized* units.

B&G Boosters and Universal Pumps are available in a wide range of capacities with 1/12 to 40 H.P. motors.



The comforts of B&G Hydro-Flo Heating are obtained from a unit smaller than a refrigerator.

These homes have modern Hydro-Flo hot water (hydronic) heating systems equipped with B&G Booster Pumps. Builder reports that the many exclusive advantages of B&G Hydro-Flo Heating helped sell these homes fast.

Send for Catalog of B&G Hydro-Flo Products

BELL & GOSSETT COMPANY

Dept. FX-4, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

ARMY RECRUITING OUTDOOR ICE SHOW

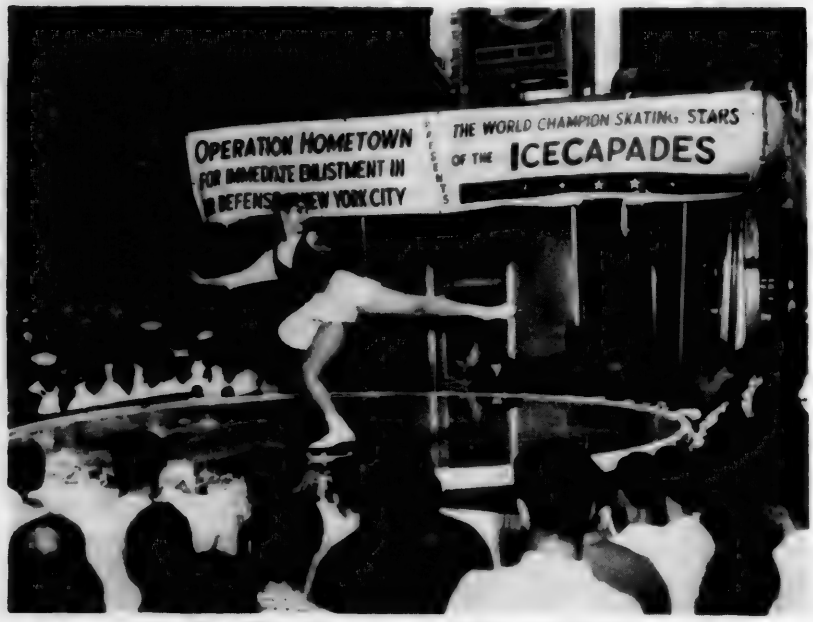
enjoyed by Times Square strollers during hot summer days. Special portable rink designed to be dismantled for shipping.

During the heat of an August day, New Yorkers in the Times Square area were treated to an outdoor ice skating exhibition, as part of a drive by the U. S. Army to secure recruits. A group of five skaters from the Ice Capades came up from Atlantic City, N. J., to perform.

The rink consists of an aluminum plate of 16 ft diameter resting on ½ inch plywood and a ½ inch layer of cork. The skating area can be dismantled into six sections. A one-inch space between the aluminum plate and the plywood is filled with a glycol solution and this fluid is not removed when the rink is taken apart for shipping.

Each of three sections is served by one supply line and one discharge line. Cooling is provided by two 3-ton compressors. There is ample valving of the system so that when the rink is taken apart, the valves are closed, pipe connectors taken apart, and the only fluid wasted is that in the short connectors. The hose used is covered with aluminum foil for insulation as it is exposed to the sun.

In operation, when the temperature of the plate is brought down, it is sprayed with water, and an ice coating of sufficient thickness soon builds up. At this show, it was 1½ inches thick. The rink is covered with plywood between performances.



New York City enjoys an outdoor ice show in August.

NEW WAYS TO HEAT BUILDINGS

scheduled for full-day review at BRI Fall Conference. Papers will cover new solar, air, wet, and radiant heating systems.

As part of the Fall Conference of the Building Research Institute which will be held November 17 to 19 at the Shoreham Hotel, Washington, D. C., the entire second day has been set aside for papers and discussions on new methods of heating buildings. John Everetts, Jr., of the firm of Charles S. Leopold, Philadelphia, Pa., is conference chairman.

A paper, Energy and Fuels for New Heating Systems, will cover the development of new energy sources and trends in availability of fuels and their application to new heating systems. There will also be a talk on the new air heating methods which will review recent research and development work on methods and equipment. It will cover conventional, high pressure and unitary systems.

The subject of new wet heating systems will review recent research and development work and implications for future building design. Conventional hot water, high temperature hot water and steam will be covered.

A paper on Radiant Systems for Heating will have information on various designs and also air-floor and infra-red radiant systems.

New Electric Heating Systems will present data on direct resistance heating, heat pumps and thermoelectric systems. Performance experience with new installations will be reported and analyzed.

The Future of Solar Heating Systems will review recent work on solar collectors and storage. Of special importance will be the analysis of data from several new solar heated houses.

For more details regarding this meeting, write to Building Research Institute, 2101 Constitution Ave., N.W., Washington, D. C.

WESTERN EXHIBIT

to hold separate sessions for engineers, contractors, journeymen, and the general public.

Ten special clinics, sessions, and seminars are written into the educational program of the 3rd Western Air Conditioning, Heating, Ventilating and Refrigeration Exhibit and Conference, Arthur J. Hess, first vice-president, announces.

Scheduled for April 27-30, 1960, in Shrine Exposition Hall, Los Angeles, Calif., the event is expected to attract 20% more attendance than the previous show held in 1958. Particularly, it will serve the rapidly expanding market of the thirteen western states, including Alaska and Hawaii, conference officials state.

Mr. Hess, co-partner of the firm of Hess, Greiner and Polland, and ASHRAE president, says the show, as in the past, will be sponsored by

(Concluded on page 137)

gives you...

STANDARD COILS · CUSTOM COILS

to meet any requirement and any design load

When you think of coils, think first of McQuay with the years of research and know-how which has made McQuay the nation's leading coil manufacturers. McQuay gives you the exclusive Ripple-Fin coils with tubes pressure expanded into wide, full fin collars to provide a permanent bond . . . actually forming a tube within a tube for maximum heat transfer. McQuay coils are made in 5/8", 1/2" or 3/8" tube diameters, one to twelve or more rows, and in the widest possible range of styles or capacities, with a choice of from one to fifteen fins per inch for maximum heat transfer efficiency and to permit accurate balancing of capacities with the design load. They are available for steam, hot water, cold water, direct expansion and refrigerant condensing, and can be made of any required or desired metal or combination of metals. When you specify McQuay you have selected the very best. For information on any coil requirement, call your McQuay representative, or write McQuay, Inc., 1619 Broadway Street N. E., Minneapolis 13, Minnesota.

one to 12 rows deep
one to 15 fins per inch

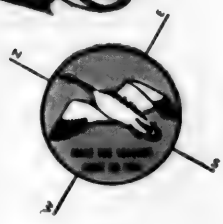
WATER COIL

DIRECT EXPANSION COIL

McQuay Means Quality

McQuay INC.

AIR CONDITIONING · HEATING · REFRIGERATION



Scientific Frontiers

● A new super-cold refrigerator the size of a flashlight battery promises significant improvements in the detection of enemy missiles and aircraft. The tiny cooler can be used to chill present airborne infrared target detectors down to minus 350 deg. F to make them ultra-sensitive, and therefore capable of spotting aircraft or missiles from far greater distances than is now possible.

The eight-ounce refrigerator, called the MinIRcooler, is the first commercial application of a new process for producing extremely low temperatures developed during the past two years by Dr. Howard O. McMahon, vice president, and William E. Gifford, of Arthur D. Little, Inc., industrial research and engineering consultants. The process and device were described by Dr. McMahon to scientists attending the Cryogenics Engineering Conference at the University of California, Berkeley.

Dr. McMahon pointed out that cooling infrared detectors to extremely low temperatures increases their sensitivity and thus their range. It also makes the target detectors responsive to a wider range of infrared wave lengths, making it possible to detect smaller temperature differences between the "target" and its surroundings.

The ADL process and its ultimate application in a variety of small, efficient coolers is expected to unlock many significant new uses in addition to the infrared use, according to McMahon. He pointed specifically to cryotrons and solid-state masers, which operate in liquefied helium at 452 deg below zero F (4.2 deg Kelvin). At present the equipment needed to maintain the helium at this temperature is bulky. When cryotrons are incorporated in miniaturized computers, supplementary refrigerating equipment will be of great importance. The Gifford-McMahon process will make it possible to recycle the evaporated helium in a closed system without using large cryostats. So, too, solid-state masers used for microwave amplification in radar and radio astronomy require a similar recooling system.

A complete airborne detection system based on the new cooler would weigh less than 20 lb. Further development work is expected to reduce this to less than half. The tiny cooler is unique in its simplicity, having no cold moving parts except a small plastic piston. In operation, pressurized helium gas expands in a ¼-inch dia cylinder two inches long. The expanding gas cools an infrared cell at the end of the cylinder.

The process described by McMahon refrigerates to an exceedingly low temperature by passing compressed helium gas through a small "engine" very much like an ordinary steam engine. The expanded helium, after it has been through the engine, and cooled, is used to cool the compressed helium, which is coming to the engine. Therefore lower and lower temperatures are achieved by this "bootstrap" process. The MinIR-cooler takes only three minutes to reach minus 315 deg F (80 deg Kelvin) by this process. The features of the process which make it advantageous are that it is simple, reliable, easily miniaturized and inexpensive.

● Electric power from nuclear or solar heat for space vehicles has been the subject of a three-year development program in a special research facility by The Garrett Corporation's AiResearch Phoenix Div. Possible application of the energy converted by a turbo-generator system developed by AiResearch for the Wright Air Development Center, Air Research and Development Command, is in space communication, vehicle environmental control such as heating or cooling, and electrical propulsion.

The power conversion system, which consists of a turbine, generator, pump, condenser-radiator and heat exchanger, is designed to run continuously for two years in space. Power output of these systems can range from one kilowatt to several megawatts.

Operation of the system consists of a Rankine cycle utilizing mercury as the working fluid. Heat from a nuclear or solar source is transmitted by a heat exchanger to the working fluid, mercury. Expansion of the vaporized mercury through the turbine drives a generator which provides the electrical power. Vaporized mercury is returned to a liquid state by a condenser and the excess heat is radiated to space. The liquid mercury is pumped back to the heat source to complete the energy cycle.

● A new flowmeter for liquids that uses ultrasonics—sound waves at frequencies higher than the human ear can hear—has been developed by Gulton Industries, Metuchen, N. J.

Conventional flowmeters use mechanical devices inside the pipe through which the liquid flows. These tend to wear out under the impact of the liquid or corrode if used to measure such fluids as acids. An ultrasonic flowmeter has been sought because the transmitter and receiver for the sound waves can be imbedded in the walls of the pipe and nothing need be put inside it. Most attempts to produce such flowmeters have been based on measuring the time required for a sound wave of a given frequency to cross a known distance in the stream of liquid.

The Gulton flowmeter instead sends an ultrasonic beam across the stream and measures the shift of the beam under the influence of the flowing liquid. The sound from the transmitting device—called a transducer—echoes back and forth inside the pipe. Because of the shift of the beam, only a fraction of it is picked up by the receiver in the opposite wall of the pipe. It appears there as a small voltage which can be amplified and read on a voltmeter, and which varies with the velocity of flow in the pipeline. The circuits are designed to modify this voltage according to the density of the liquid so that the output to the receiver measures both rate of flow and mass of liquid.

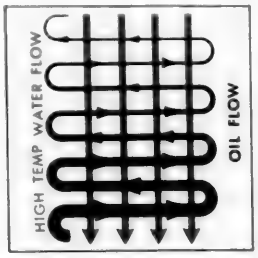
HOW TO USE high temperature water directly in a no. 6 oil heater–with no danger of system contamination!

The unique Paracoil "Thermo-Film" heater permits *direct use of HTW in the same heater shell with the fuel oil.* The "Thermo-Film" design provides all necessary circuit isolation. This means smaller space requirements, simpler operation and lower installation costs than alternate methods using intermediate exchangers with inter-connecting piping, regulators, level controls, etc.

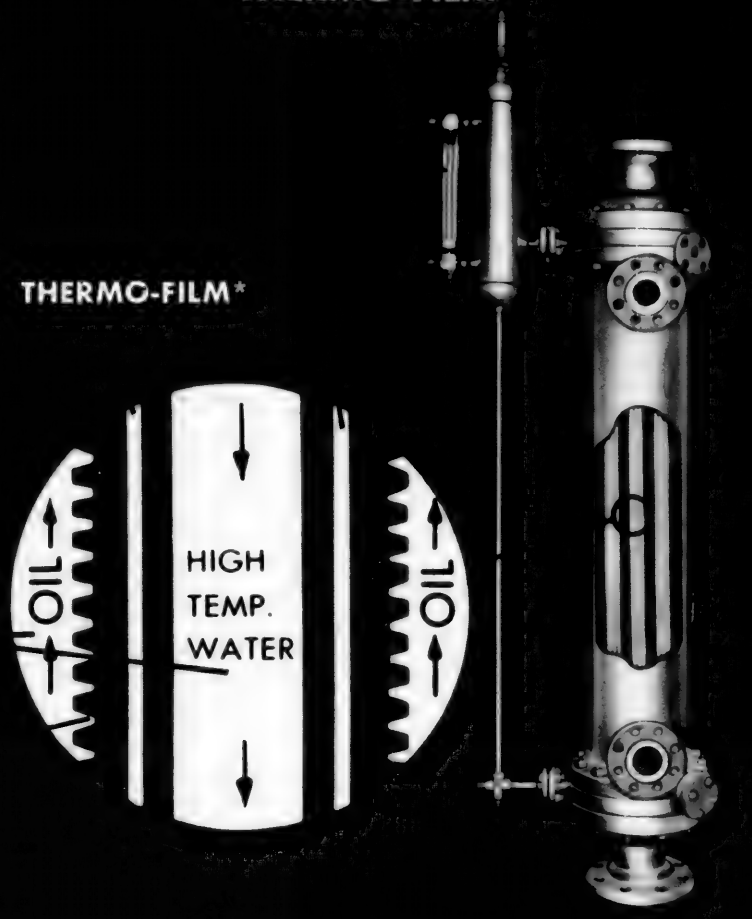
COMPLETE ISOLATION of HTW and fuel oil is accomplished by a coaxial tube assembly, with heat-transfer liquid separating inner and outer tubes. *Boiler contamination in the event of oil tube failure is impossible.*

EXTENDED SURFACE of outer tubes substantially reduces size and weight of heater.

INTERNAL TURBULENCE — with oil baffled back and forth across heating tubes — increases heat transfer rates and reduces bulk of the heater.



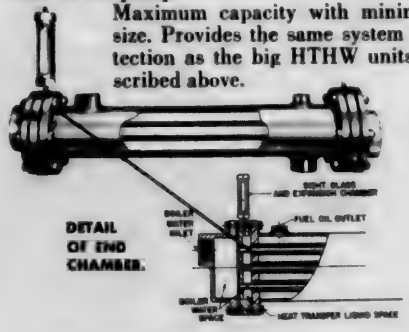
"THERMO-FILM"



DAVIS ENGINEERING

ALSO–LOW PRESSURE MODELS
Compact units using low pressure boiler water, for installation on suction or discharge side of oil pump.

Maximum capacity with minimum size. Provides the same system protection as the big HTHW units described above.



TURN PAGE FOR ADDITIONAL DESIGNS OF PARACOIL FUEL OIL HEATERS — YOU MAY HAVE BEEN LOOKING FOR ONE OF THEM!

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
First Class Permit No. 459, Passaic, N. J.

DAVIS ENGINEERING
(A Division of American Metal Products Company)
520 MAIN AVENUE.
WALLINGTON. N. J.

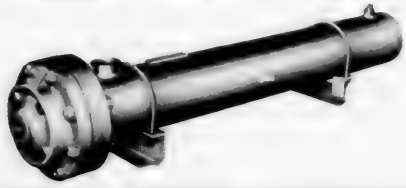
which of these fuel oil heating problems can Paracoil help you solve?

UNDERGROUND STORAGE

INTERMITTENT PLANT OPERATION

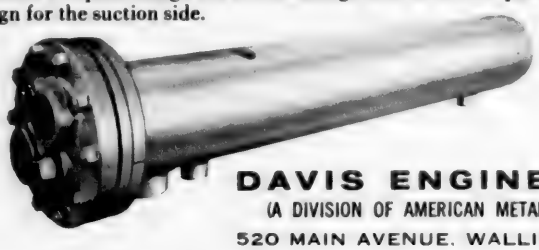
HIGH CAPACITY OUTPUT IN LIMITED SPACE

This famous Paracoil Tubular Fuel Oil heater, using steam as the heating medium, provides remarkably high heat transfer rates. Space requirements and weights are at a minimum.



SUB-WATER LINE OR STEAM SYSTEMS

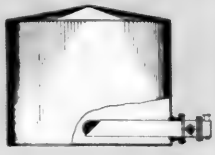
The Paracoil U-Tube type Fuel Oil Heater has been a standard of the fuel oil heating industry for years, can be used for sub-water line or with steam. Features a 6-pass design for the discharge side of the oil pump—a 2-pass design for the suction side.



DAVIS ENGINEERING
(A DIVISION OF AMERICAN METAL PRODUCTS CO.)
520 MAIN AVENUE, WALLINGTON, N. J

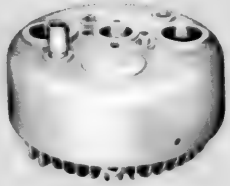
PUMPING VISCOUS NO. 6 OIL FROM STORAGE TANKS

Tank suction heaters are used to lower the viscosity of No. 6 fuel oil before it enters your circulation system. Reduces strain on the pumps. For economy of operation, only the oil being withdrawn is heated—not the entire tank contents.



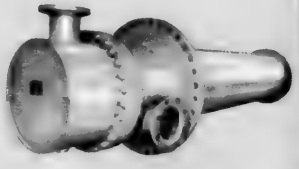
Tank Suction Bell Heaters

For small-to-moderate demand installations. Easily inserted through standard 16″ tank manhole. Available in two sizes, 6 sq. ft. and 12 sq. ft. heating surface.



Horizontal Tank Suction Heaters

For higher capacity installations. Various designs to suit your own application. Model shown carries flange at inlet end for seal-off valve permitting removal of tube bundle from a full tank.



DAVIS ENGINEERING ACHV
(A DIVISION OF AMERICAN METAL PRODUCTS CO.)

Please send me information and specifications on the following fuel oil heaters:

- ☐ THERMO-FILM HEATERS (see reverse side of this page)
  - ☐ High pressure model
  - ☐ Low pressure model
- ☐ Tank Suction Heaters
- ☐ Tubular Fuel Oil Heaters
- ☐ Type GF Indirect Gas Fired Heater
- ☐ U-Tube Fuel Oil Heaters

My application is_____

Name_____

Title_____ **Dept.**_____

Company_____

Address_____

City_____ **State**_____

◀ MAIL THIS CARD for information and specifications on any heater shown on this page

Still no sign of wear or corrosion in Patterson-Kelley storage water heater

AFTER 26 YEARS OPERATION

Credit Revere Copper for this outstanding performance

The copper-lined heater you see above was installed in the Bronx County Courthouse Building, New York City, in 1932, and processes rust-free hot water for the 1,000 staff members and more than 5,000 visitors daily.

Department engineers inspected the heater annually, the last inspection being in June, 1958. At that time the above photo was taken of the heater's interior. After 26 years constant use, processing over 8,500,000 gals. of water at the average rate of 4 tons per day, the heater was found to be in excellent condition, all original fittings in good operating condition and copper tube bundles and supports showed not one sign of wear or corrosion. Once again copper has proved a most efficient, economical and durable material in storage water heater service.

Find out how copper and its alloys can help you in your corrosion problems, whether it be storage water heaters, heat exchangers, condensers or distillation units. Call on Revere's Technical Advisory Service with its great storehouse of knowledge on this subject.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801
Executive Offices:
230 Park Avenue, New York 17, N. Y.

Mills: Rome, N. Y.; Baltimore, Md., Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities. Distributors Everywhere.

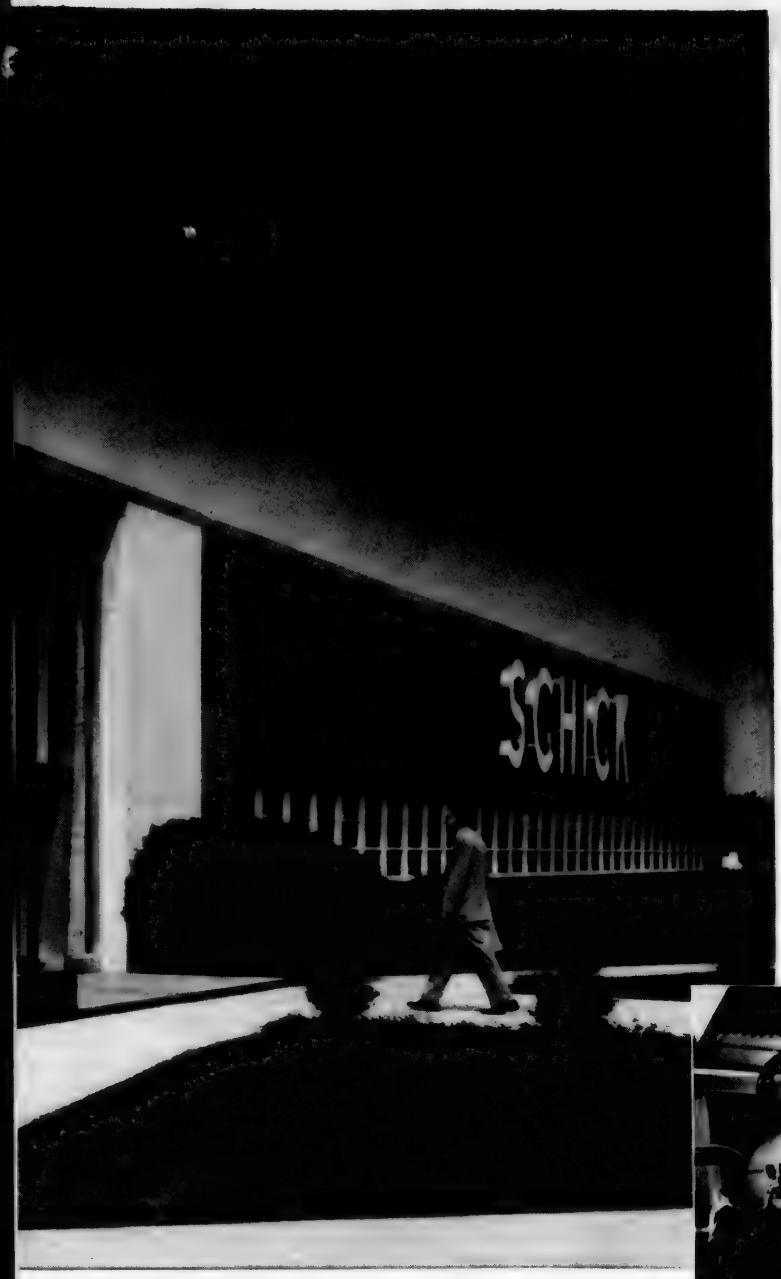
"We get all-year humidity control at low cost...thanks to GAS-operated CARRIER absorption refrigeration"

Thomas M. Garry, Schick Incorporated

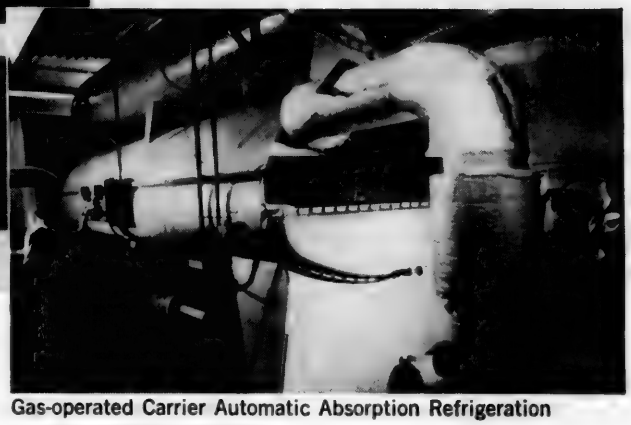
VICE-PRESIDENT OF MANUFACTURING

"We needed refrigeration equipment which would give exact humidity control all year 'round to minimize rusting of the highly-polished parts used in making shaving heads. Our 595 ton gas-operated Carrier Absorption Refrigeration unit does the job with top efficiency...and provides comfort cooling for the entire plant at low operating costs."

The Carrier Absorption unit uses ordinary tap water as a refrigerant. No prime mover is required, only low pressure steam or hot water. Seasonally idle boilers can be put to use all



Pioneer producer of electric shavers, Schick Incorporated, occupies this modern, efficient, and completely air-conditioned building in Lancaster—heart of the Pennsylvania Dutch country.



Gas-operated Carrier Automatic Absorption Refrigeration

- cuts operating expenses
- minimum maintenance required
- low installation cost
- adjusts automatically to cooling load
- compact and light weight

year around... and with gas as the boiler fuel, operating costs are cut to a minimum. Low maintenance is another substantial savings, since there are no major moving parts to get out of order, need replacing or repair.

Because of low installation, operating and maintenance costs, the gas-operated Carrier Automatic Absorption units can be the source of important savings. For full details, call your local gas company, or write to the Carrier Corporation, Syracuse, New York. *American Gas Association.*

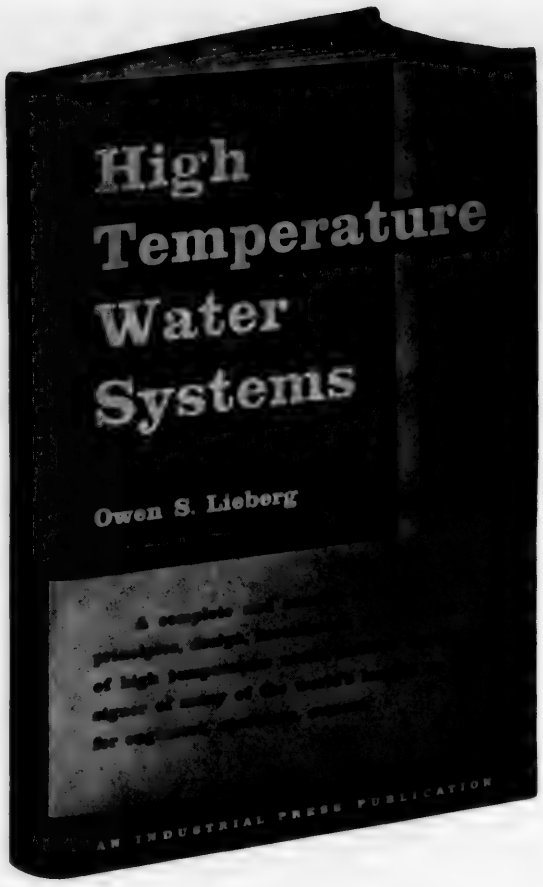
NEW • COMPLETE AUTHORITATIVE

HIGH TEMPERATURE WATER SYSTEMS meets the need for an authoritative explanation of the principles, design and operation of high temperature water (HTW) systems.

The author is a distinguished international authority who served as consultant on the largest HTW system in England (Bicester Ordnance Depot) and such U.S. installations as the Forbes and Olmstead Air Force Bases and the Cross factory in Detroit. He also designed the HTW system for the largest military establishment in Canada.

The book contains original design data used successfully in actual systems. Tables, graphs, photographs and specifications serve as a working guide . . . and let you benefit from Mr. Lieberg's knowledge and experience.

A special feature is a full-chapter treatment of the design of a typical system . . . step by step . . . based on the principles developed in the book. After mastering this procedure, the engineer will have little difficulty in completing the design of *any* HTW system!



CONTENTS

1. **Advantages of High Temperature Water**
   Arguments for HTW. Brief history. Sample calculation comparing HTW to steam.
2. **Thermal Properties of Water**
   Basic thermodynamics. Units defined. Property tables for water and steam.
3. **Some Design Considerations**
   Temperature drop, system pressure, thermal storage, system flexibility, secondary steam.
4. **Pressurizing the System**
   Reviews pressurizing methods: Steam, air, inert gas. Special cases; heat-power systems.
5. **Boilers and Expansion Tanks**
   Boiler selection. Water tube boilers. Summer load conditions. Sizing expansion tanks. Nitrogen pressure tanks.
6. **Controlling the System**
   Combustion control for various fuels. Control panels. Water level and flow control. Btu meters.
7. **System Circulation Pumps**
   Great detail covering the "heart of the system." Guarding against flashing. Pump specs. Friction heads. Parallel pumps. Auxiliaries, drives, piping.
8. **Valves**
   Valve types and selection. Materials. Emergency closing valves. Valve sizing. Venting by air bottles.
9. **Piping**
   Heat flow capacity of pipes. Design temperature drop. Expansion loops and joints. Pipe sizing and insulation.
10. **Process Heating**
    HTW for process heating. Heat exchangers and converters. Valving and control for process.
11. **Space Heating with HTW**
    Unit heaters. Fan-coil systems. Radiant panels. Complete with application data for all systems.
12. **Applications**
    Describes numerous military and civilian installations in U. S., Canada, and Europe. Economic and design comparison with low temperature water and steam systems for similar situations.
13. **Designing a Typical System**
    Ten-step design procedure for any HTW system. Theory and practice summarized and applied to complete design example.
14. **Appendix**
    A complete specification of a typical boiler plant and auxiliaries for a high temperature water system.

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

Please send me ..... copies of High Temperature Water Systems.

☐ Check or money order is enclosed. Send book(s) postpaid. Foreign orders—except from Canada—must be accompanied by payment in full, including 50c postage charges per book.

☐ Send book(s) and invoice, including postage. I will pay within five days if I decide to keep the book(s).

☐ Bill me ☐ Bill company

Name .....

Company .....

Company Address .....

City ..... Zone ..... State .....

Home Address .....

(Please fill in if you want book sent to your home) ACH&V/10/59

$6.50

224 pages, 109 illustrations
Design tables and graphs

To order, use coupon at left or circle letter M on postcard, last page.

ANSWER TO MANY "IMPOSSIBLE" VENTILATION PROBLEMS

Do you require ventilation for "problem" areas like these:

- Large areas where wall locations are not available?
- Areas where duct work would prove too expensive?
- Areas where ducting would use valuable production space?
- Areas where ducting would prevent periodic layout modifications?

Then packaged "Buffalo" Sky-Vent Power Roof Ventilators are your practical answer. High capacities (1000 thru 250,000 cfm) reduce costs by minimizing number of roof installations. Shipped as ready-to-operate units, they save installation time and money. Husky, durable construction includes integral curb flanges — internally braced hoods to withstand heavy snow loads and hurricane winds — coated with thick cork-impregnated asphalt for corrosion resistance. High efficiency "Buffalo" Fans move maximum air per horsepower. Write for Bulletin FM-2345.

"SHORTCUT" TO MAKE-UP AIR

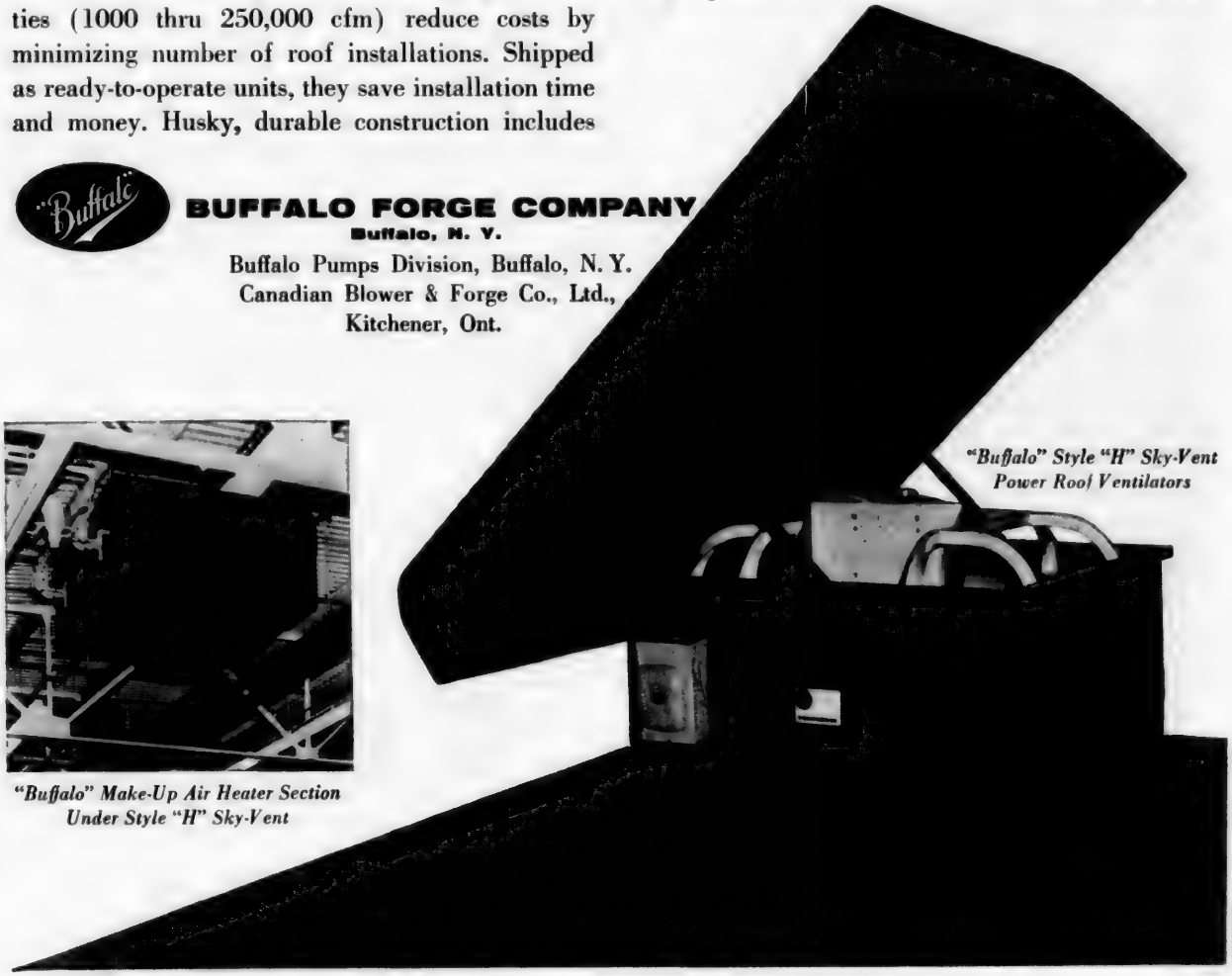
"Buffalo" Make-Up Air Units are easily-installed, factory assembled "packages" designed to supply high capacity heated and/or filtered air in conjunction with exhaust ventilation. Mounted in roof or wall, they eliminate the need for costly, space-consuming ducts. Highly flexible for installation in new or present buildings. Available with face and by-pass and/or fresh and return air dampers, filters, non-freeze heating coils, propeller fan and motor. Also with reverse design wheels for summer exhaust. Write for Bulletin 2345.

For complete facts on these versatile "Buffalo" ventilating packages, call your "Buffalo" engineering representative — or write for above bulletin.

BUFFALO FORGE COMPANY
Buffalo, N. Y.

Buffalo Pumps Division, Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" Make-Up Air Heater Section Under Style "H" Sky-Vent



"Buffalo" Style "H" Sky-Vent Power Roof Ventilators

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

Underground Heat Distribution Systems

How To Protect A System Against Failure

Specifications are the *only* way a designing mechanical engineer can be assured the final project will have met his required standards and be of the quality the owner bought.

Three major elements make up an underground heat distribution system: an inner pipe to convey steam, high temperature hot water, chilled water, condensate, etc., (type and size depending upon project requirements); the insulating of the inner pipe to minimize heat loss; and the outer casing to protect the insulation and inner pipe.

The outer casing has to be specified in such a way that it will provide positive protection against moisture entrance and accumulation. Saturated

Testing welded joints by applying a soap solution with the casing under 25 p.s.i.g.

insulation, of course, equals low efficiency. Moisture, present constantly in buried pipe, accelerates corrosive action which is amplified in acidic and electrolytic soils.

To be positively leak tight the casing must be tested air tight. The engineer should specify a 25 p.s.i.g. air test on the casting for two consecutive hours without a drop in pressure.

In order to prevent accumulation of moisture, the casing should be specified with a smooth interior.

Impact from above and earth back fill weight is a problem the engineer resolves by specifying a 14 gauge steel casing with a spiral lockseam for added crush resistance.

Now knowing that his casing is impact and water proof he protects the casing by specifying an anti-corrosive compound that will withstand a 15,000 volt spark test and have a permeability of .05 perms or less.

With the casing and joints sealed leak tight and protected against electrolysis and sub-soil acids he needs only one bit of . . .

Final Protection

Any system should be selected with this thought in mind:

"That some moisture will find a way into the system such as a rain storm prior to installation."

Therefore, to protect the system against any moisture that may get inside prior to final assembly, he specifies "that an annular uninterrupted air space must run the entire length of the system." With this feature and openings at ends of casing for draining and venting, he can force ventilate the system and dry it out. By necessity, the insulation must, of course, have an insoluble binder and be capable of returning to its original insulating efficiency when dry, even after a thorough saturation.

For a free 24 page catalog with facts and figures for designing and specifying underground heat distribution systems, write: E. B. Kaiser Co., 2114 W. Lake Ave., P. O. Box 47, Glenview, Illinois.

"...for highest quality"

EBKO

PIPING SYSTEMS

TOUGH BUYERS demand Reznor unit heaters...
In 70 years, only 1/10 of 1% factory replacement!

If you want to avoid extra servicing and call-backs, you've *got* to be a tough buyer! You've got to pick a heater that not only works right when you buy it, but will keep on working right. That's why so many plumbing, heating and air-conditioning contractors demand Reznor. There may be less expensive heaters on the market, but none with Reznor's long-term performance record: only 1/10 of 1% factory replacement in 70 years!

EVERY UNIT FLAME-TESTED . . . You can be sure that your Reznor heaters will arrive in top running order. We flame-test each unit before shipment. Saves you the bother and expense of uncrating and bench-testing, too.

LONG-TERM FUEL SAVINGS . . . Here's where your customers benefit from your "tough buying." Reznor's sensitive, long-voltage thermostat and controls, and two-speed fan with automatic speed selector, keep heat even, without blasts. A Reznor uses less fuel to maintain comfortable heat.

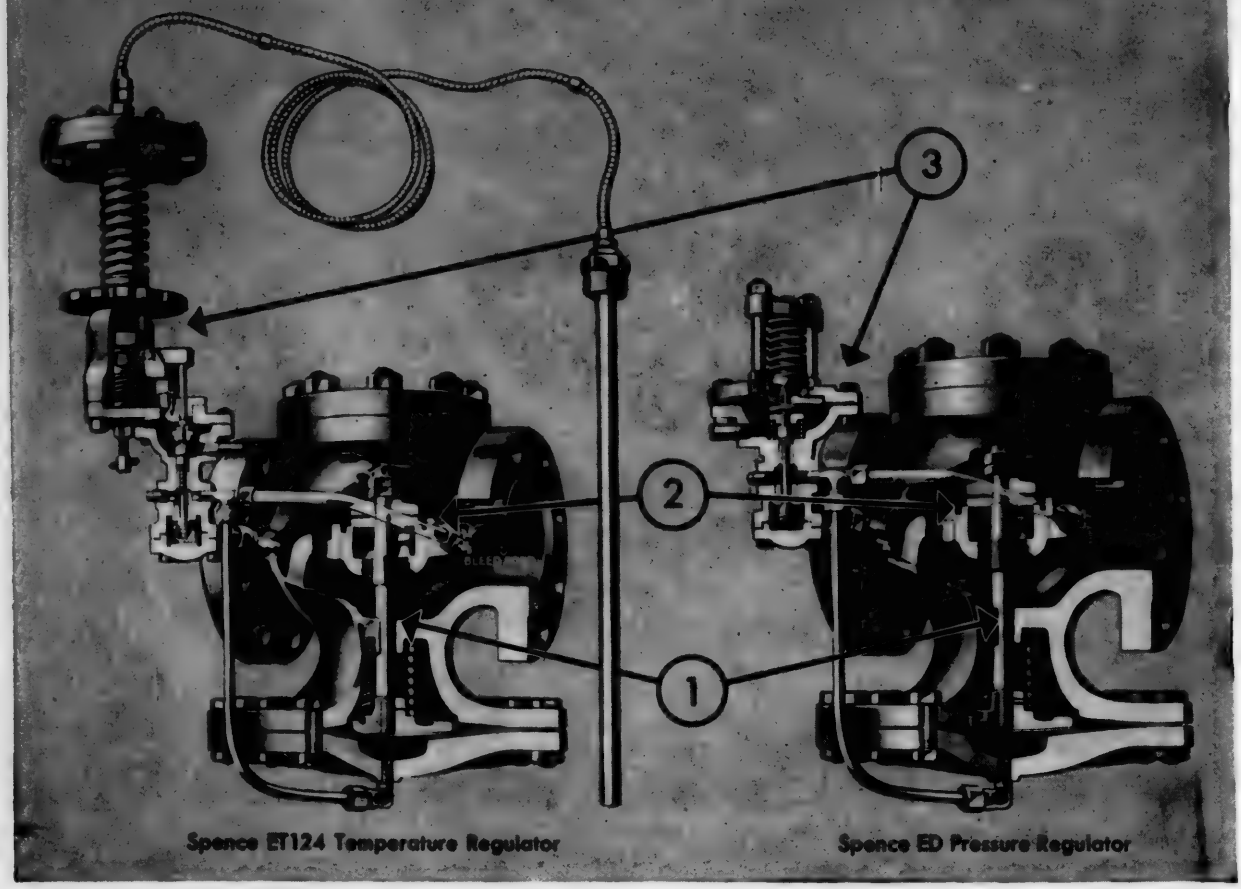
For the full story, phone your Reznor distributor, or write Dept. 64A, Reznor Manufacturing Company, Mercer, Pennsylvania.

The heating world is full of tough buyers; that's why Reznor is the world's largest selling direct-fired heater!

REZNOR HEATERS

"THE TOUGH BUYERS' LINE"

3 Tips for Low Maintenance in Automatic Regulating Valves



No engineer has to be told that downtime of regulating valves is costly—and a nuisance.

Nowadays the men who keep these valves operating want to make sure they aren't stuck with a maintenance headache for the life of their valves. That's why we are outlining this simple check list which covers three important features which keep maintenance costs down.

1. Stuffing boxes are probably the number one time consumer in valve maintenance. No matter how you figure it, repacking stuffing boxes is costly.

That's one reason Spence uses a "balanced" diaphragm construction which eliminates stuffing boxes. Simple stem guiding and large metal diaphragm operation reduce sticking and binding to a minimum.

2. Another problem is replacement of seats and discs when they've been cut by steam. Today you can forget about this problem entirely by insisting on an unconditional guarantee against wiredrawing. Spence, for instance, uses SECO Metal seats and discs and gives such a guarantee.

3. Any valve designed to control temperature and pressure within tight limits can be affected by dirt in the steam lines. You can't get a guarantee against this, but you can specify a valve that makes trouble shooting easy. Here's the tip:

Make sure your regulating valve is controlled by an external pilot. If trouble develops, it is easy to find out if it is in the pilot or the main valve with a simple test.

If the trouble is in the pilot, you can remove it without taking the main valve out of the line.

The quickest way to get the regulator working again is to install a spare pilot. This is easy—and in the Spence design it is not expensive to carry spare pilots. Spence pilots fit all sizes of Spence main valves.

These maintenance advantages plus other advanced features are available in a wide range of Spence automatic regulating valves. For more information write for the Bulletin TE.

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

SE-144

T & B
Imperialine

Imperialine

EXTRUDED ALUMINUM GRILLES

¾" FLAT MARGIN

⅜" FLAT MARGIN (FLUSH)

½" BEVELED MARGIN (FLUSH)

1" BEVELED MARGIN

Featuring trim, attractive straight-line styling, Tuttle & Bailey's IMPERIALINE Extruded Aluminum Grilles are the answer to architectural demands for air distribution equipment that will harmonize with, or accent, linear design concepts. Universal in application, where fixed bar settings meet performance requirements, they may be used on the supply or return portions of heating, cooling or ventilating systems and are ideal for ceiling, sidewall, floor or sill installation.

IMPERIALINE Grilles can be supplied as single units up to 72" in length or as butted sections where long, continuous runs are desired. They are available in widths of 1½", 2", 3", 4", etc., up to 18". The standard flat and beveled margin designs are shown at left.

Grille bars can be furnished set straight, deflected 15° or 30°. Adjustable rear deflection bars and face-operated volume control dampers are available.

For complete information, see your nearest Tuttle & Bailey Representative or write us direct.

TUTTLE & BAILEY

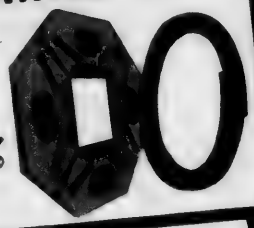
division of Allied Thermal Corp. New Britain, Connecticut

Tuttle & Bailey Pacific, Incorporated, City of Industry, California

IN TUBING, Nothing Beats Copper! IN COPPER TUBING, Nothing Beats READI-FIN

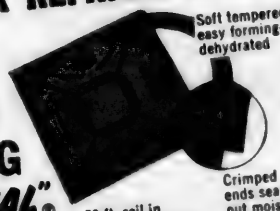
For COPPER WATER TUBE

Specify READING "LEKTRONEAL"®



For COPPER REFRIGERATION TUBE

Specify READING "LEKTROSEAL"®



Also Specify READING

for
- COMMERCIAL COPPER TUBE
- RED BRASS & COPPER PIPE
- THREADLESS COPPER PIPE

For FINNED COPPER TUBE

Specify READI-FIN®

A line of heat transfer tubing made by Readi-Fin Mfg. Co., Inc. (a subsidiary of Reading Tube Corp., at Reading, Pa.). The extended surface is extruded from the tube wall, thus eliminating the possibility of fin failures resulting from thermal shock, corrosion and erosion. This "one-piece" (integral) construction provides maximum heat transfer efficiency, ruggedness, easy fabrication and freedom from fouling. It's available in Water Tube types with finned or plain ends and in Condenser Tube types with finned, plain or stripped ends.

For PRECISION COPPER TUBE

Specify MACKENZIE WALTON

(A Subsidiary of READING TUBE CORP.)
PAWTUCKET, R. I.

- Famous for Accurate and Fine Finish Tubing
- Quality Controlled from Start to Finish

READING COPPER BRASS TUBE And RED BRASS PIPE

Sold Through Wholesalers Only ®

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

READING TUBE CORPORATION

Empire State Building, New York 1, N. Y., Plant: Reading, Pa.

Distribution Depots:

READING, PA.

ATLANTA, GA. 690 Murphy Ave. S.W., Unit 5, Bldg. B

WOODSIDE, L. I., N.Y. 57-17 Northern Blvd.

OAKLAND, CALIF. 410 Hegenberger Rd.

PHILADELPHIA, PA. 921 Penn St.

LOS ANGELES, CALIF. 120 No. Santa Fe Ave.

CHICAGO, ILL. 305 W. 31st St.

DENVER, COLO. 2845 Walnut St.

CLEVELAND, OHIO 4615 Perkins Ave.

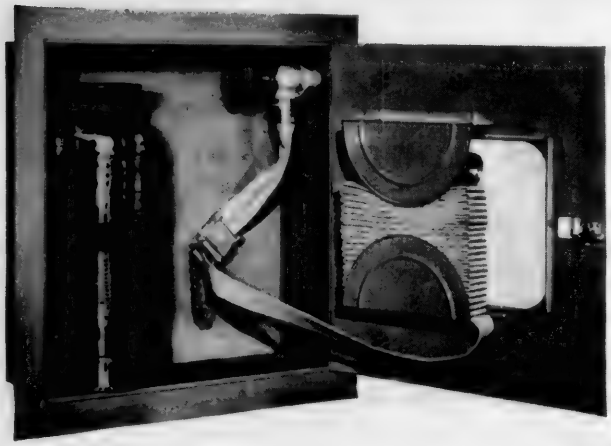
HOUSTON, TEXAS 1121 Rothwell St.

DALLAS, TEXAS—9000 Sovereign Row, Brook Hollow Industrial District

New! Fire hose cabinet with

RACK SWINGS FULL 180°

Now, when seconds count, there's no delay in fire-fighting . . . user just grabs the hose and runs! The hose is racked on the *door* instead of inside the cabinet. This door swings out—a full 180°—



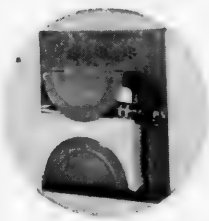
NEVER FOULS HOSE LINE

and the hose can't snag when it's needed most. The new Allenco Hozegard cabinet is the first fire hose cabinet equipment to be *completely* Underwriters listed! Each Hozegard installation saves 25% to 30% by eliminating the expensive pin-type rack and the time needed to install the hose on it.

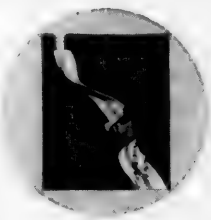
Allenco Hozegard cabinets are available with or without extinguishers and with Fire Department valve when desired. There is a choice of sizes and styles to fill most every requirement. All have steel cabinet with frame welded to body . . . hold up to 100 feet of 1½" linen hose. When specified with exclusive Hose Clip, the entire unit—cabinet and equipment—is 100% U/L listed.

SPECIFY ALLENCO . . . QUALITY FIRE PROTECTION SINCE 1887 • STANDPIPE EQUIPMENT • EXTINGUISHERS • HOSE • REELS • FIRE DEPARTMENT CONNECTIONS

FOUL-PROOF door rack



Free swinging door rack means foul-proof withdrawal and ready aiming at fire.



Exclusive hose clip makes cabinet semi-automatic—perfect for one-man operation.

Tamper-proof glass latch shield is scored for safe, easy breaking in emergency.

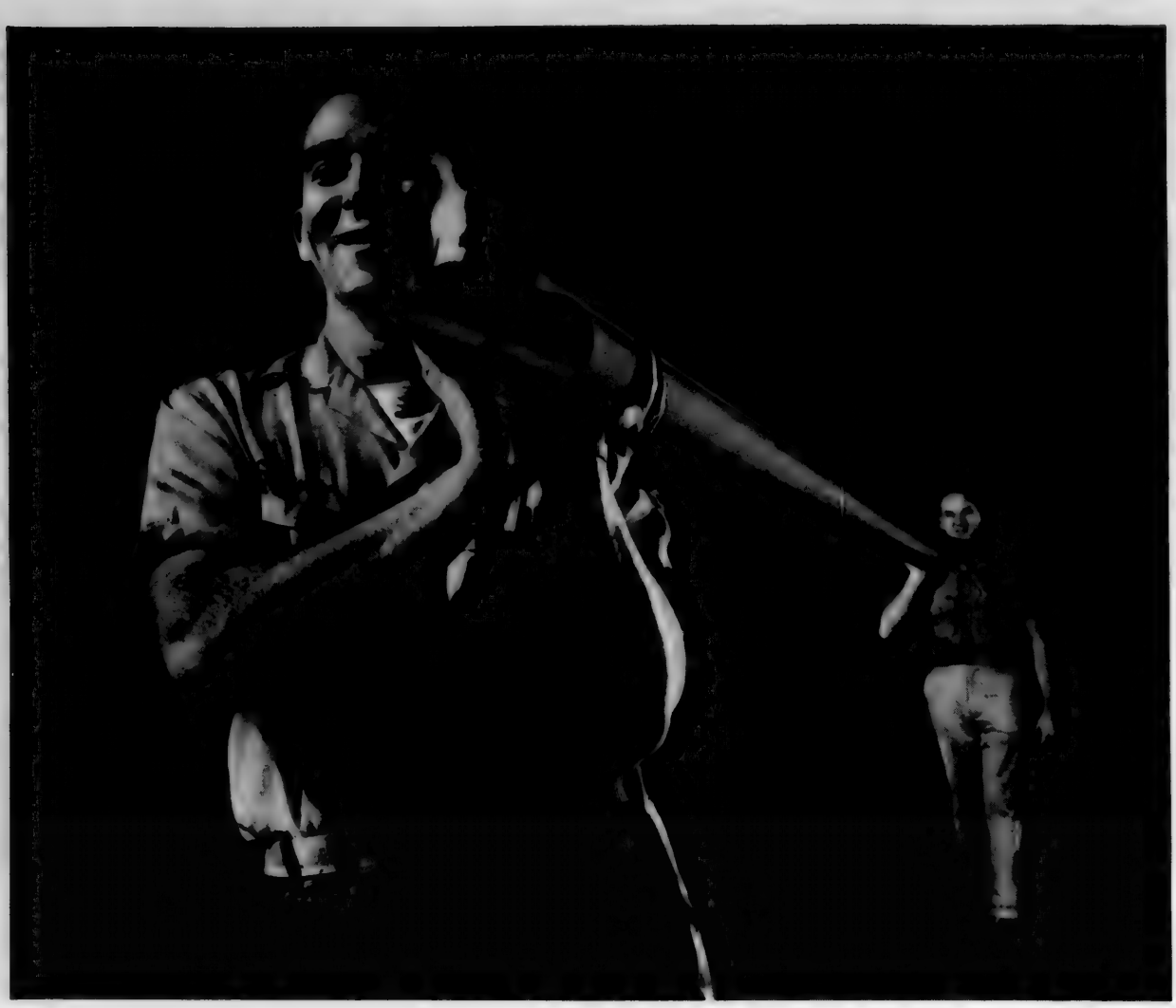
NOTE TO THE DESIGNER

You'll appreciate the contemporary styling of Allenco Hozegard cabinets. Designed to complement interior decor, they actually blend with the beauty of your building.

Requiring 35% less area—less depth, the compact Hozegard cabinet can be flush-mounted in any wall, or in the floor! The cabinet door is available in several styles and choice of 3 trims . . . custom-finished at the factory or on-the-job to your specifications.

W. D. ALLEN Manufacturing Co.

650 South 25th Avenue • Bellwood, Illinois

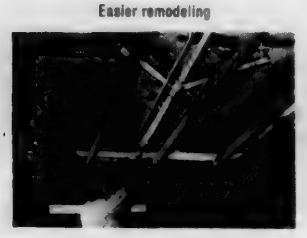


LONGER LENGTHS OF COPPER TUBE MEAN FEWER JOINTS! Anaconda Copper Tube for sanitary drainage systems comes in standard 20-foot lengths. You can install long runs with fewer joints and fittings—save installation time and cost. *Work is easier,* too, particularly overhead, because a 20-foot length of 3" Type DWV copper drainage tube weighs only 34 lb. *And you save space.* A 3" copper tube stack with fittings will fit inside a 4" partition. Solder-joint fittings make installation in tight quarters easy—for compact, space-saving assemblies. For more information on copper tube, write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

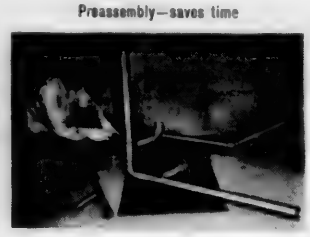
ANACONDA® **COPPER TUBE AND FITTINGS for soil, waste, and vent lines**

Available through plumbing wholesalers. Products of The American Brass Company

Easier remodeling

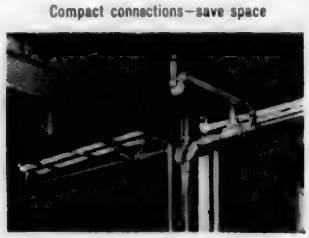


Preassembly—saves time



Lightweight—easier installation

Compact connections—save space



maintain

CONSTANT LIQUID LEVELS for ALL FLOODED SYSTEMS

with the **SPORLAN LEVEL-MASTER CONTROL**

LMC
LEVEL MASTER CONTROL

Modulated flow action . . . not ON *or* OFF

The LMC is a combination of a standard Sporlan thermostatic expansion valve and a Level-Master Element. The element consists of an insert bulb containing a low wattage heater. It assures a positive liquid level control for all flooded systems.

The LMC feeds with a modulated flow, and maintains a constant liquid level to meet varying load conditions.

The insert bulb controlling the liquid level has no moving parts . . . is not a mechanical float device.

It can be easily and economically installed directly in the shell, accumulator or liquid leg of any coil designed for flooded operation, whether it be a new or converted installation. The bulb must be in direct contact with the refrigerant.

Regardless of application or refrigerant, get Peak Performance on all flooded systems with the Sporlan LMC

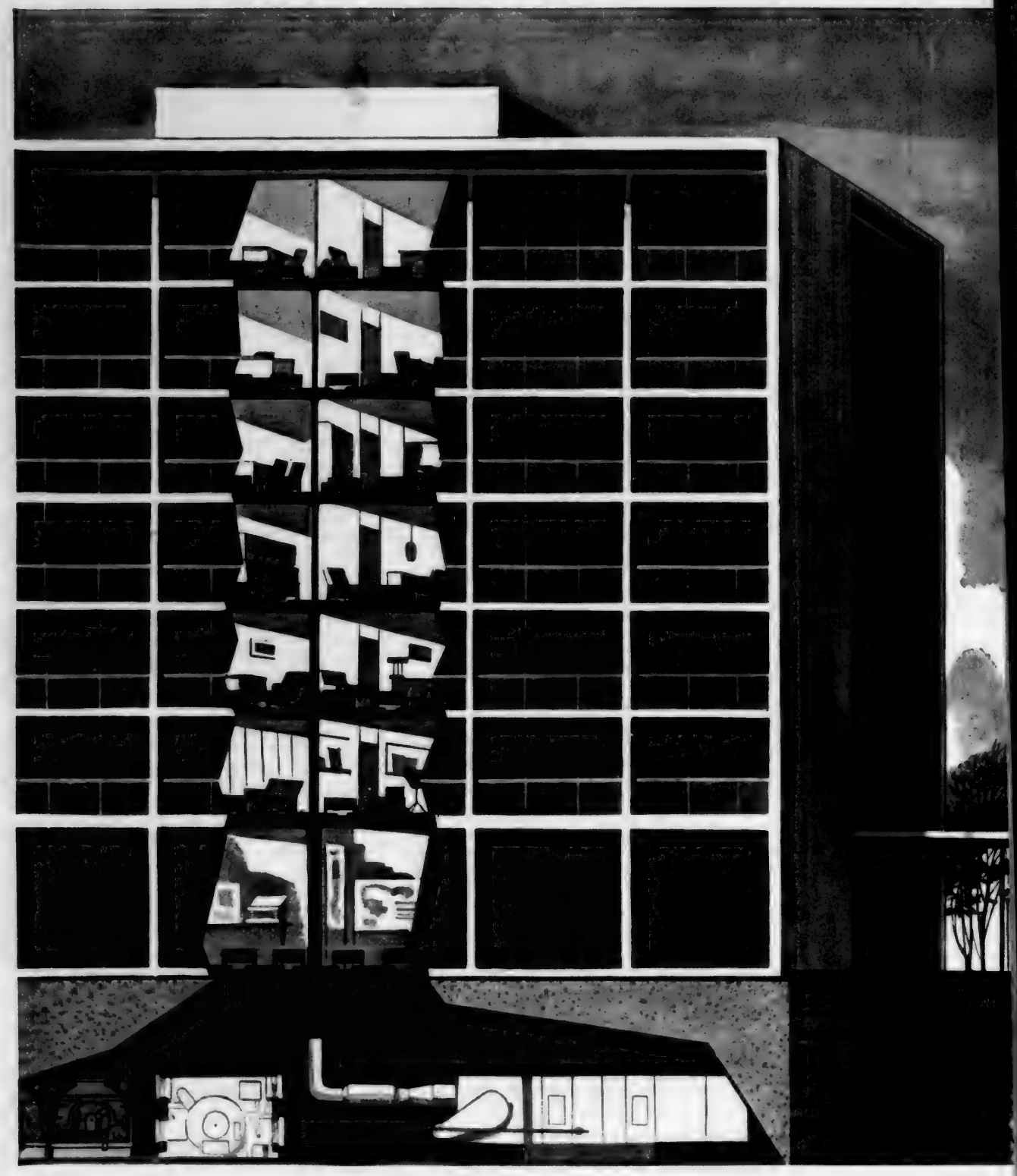
For complete details on the Sporlan LMC, ask your Sporlan Wholesaler for Bulletin 60-15.

Our 25th Anniversary . . . 1934-1959

SPORLAN VALVE COMPANY

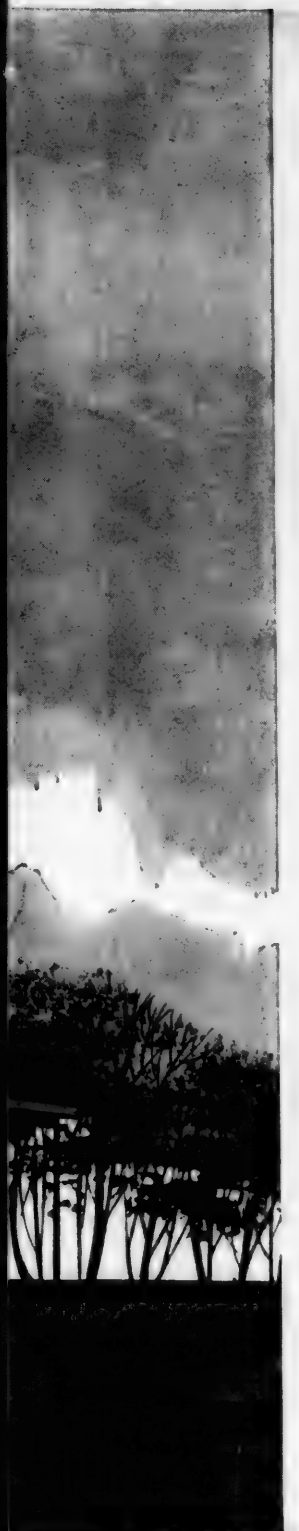
7525 SUSSEX AVENUE ST. LOUIS 17, MO.

EXPORT DEPT. 85 BROAD STREET NEW YORK 4, N. Y.



One call for all

CENTRIFUGAL REFRIGERATING MACHINES • CENTRAL-STATION AIR CONDITIONERS
PACKAGED WATER CHILLERS • PACKAGED AIR CONDITIONERS • FANCOIL UNITS
MULTI-ZONE AIR CONDITIONERS • SPRAYED COIL DEHUMIDIFIERS • HEATING AND
COOLING COILS • CENTRIFUGAL FANS • PROPELLER FANS • POWER ROOF VENTILATORS
UTILITY SETS • UNIT HEATERS • BOILERS



Why select air-conditioning equipment by the piece instead of the package?

IN BUYING a car, you wouldn't dream of going to one company for the engine, another for the body, another for the wheels and so on. You get the complete package from one source.

Today it's possible to select air-conditioning, heating, and ventilating equipment by the package instead of the piece — and get a more integrated system. American-Standard* Industrial Division offers *all* major components, from the combined American Blower, Ross Heat Exchanger, and Kewanee Boiler product lines. You benefit by having one-source responsibility for quality and performance in equipment designed, engineered, and manufactured to work together.

There are offices in all principal cities staffed with product specialists to assist with equipment selection and on-the-job problems. Call the one nearest you. AMERICAN-STANDARD INDUSTRIAL DIVISION, DETROIT 32, MICH. IN CANADA: AMERICAN-STANDARD PRODUCTS (CANADA) LIMITED, TORONTO, ONTARIO.

*American-Standard and Standard ● are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard
INDUSTRIAL DIVISION

AMERICAN BLOWER PRODUCTS • ROSS PRODUCTS • KEWANEE PRODUCTS

For the first time!

Everything you need in Dial Thermometers for Piping *and* Duct work!

A new and complete line of instruments: Dial thermometer of Marsh precision and accuracy designed down to the last detail for piping and duct work . . . for use on heating and cooling equipment, air ducts, vessels and kilns, ovens and similar applications.

Easier to read

Illustrations tell the story. Four types, seven ranges—72 stock combinations to meet every condition. Big, legible 3½" and 4½" dials . . . easy to read in places where piping and duct thermometers must be installed. Ease of reading further increased by provision for tilting and turning dials to any desired reading angle. Line includes distant reading types that take care of remote locations.

Unbreakable—more accurate

Instead of fragile difficult-to-read glass tube thermometers you now have sturdy, unbreakable, legible Marsh Dial Thermometers. Guaranteed accurate to plus or minus one division of the scale, they have far greater *readable* accuracy than any glass tube type. All have the famous Marsh "Recalibrator"—to *keep* them accurate.

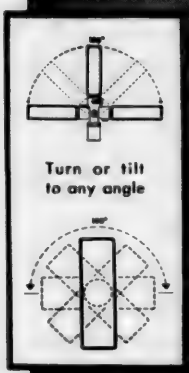
All purpose

Design provides for every on-the-job condition. Separable sockets ("wells") simplify installation—or removal for servicing. Extension necks take care of insulation on piping or ducts. Long stems in duct type put temperature-sensitive section where it belongs.

Note the brief specifications opposite. Any thermometer is available from stock.

Write for bulletin telling the whole story.

Marsh Instrument Company
Division of Colorado Oil and Gas Corporation
Dept. U, Skokie, Ill.
Marsh Instrument & Valve Co. (Canada) Ltd.
8407 103rd Street, Edmonton, Alberta



For piping

Dial sizes: 3½" and 4½"

Ranges:
0° to 100°F for chilled water
20° to 120°F for condenser water
40° to 240°F and 100° to 300° for hot water and domestic water
¾" NPT connection

All ranges, in both direct mounted and remote reading types, available with three standard sockets shown in drawing below.

For ducts

Dial sizes: 3½" and 4½"

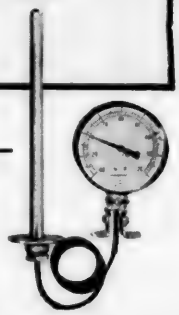
Ranges: —40° to +120°F
0° to 160°F
0° to 220°F

All ranges, in both direct mounted and remote reading types, available with standard extension necks and stems shown in drawing below.

MARSH
DIAL THERMOMETERS

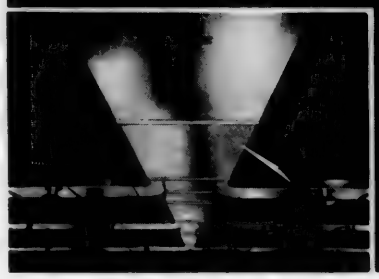
Also remote reading—

Piping and duct thermometers of same basic design available with 6 ft. of capillary tubing as shown.



See us at Booth 201
Atlantic City Nov. 2-3-4-5

SOFTITE BY WHEELING



Take a good look!

OUR CHALLENGE STANDS!

It's easy to see why our challenge stands: *Anything that can be made of steel sheets can be made of Wheeling SOFTITE Galvanized Steel Sheets.* SOFTITE will not flake or peel! Let us show you how this *modern* galvanized sheet can help you do a better job . . . and do it easier! Wheeling Steel Corporation, Wheeling, West Virginia.

WHEELING STEEL CORPORATION · IT'S WHEELING STEEL! *District Sales Offices at Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Houston, New York, Philadelphia, St. Louis, San Francisco, Wheeling*

"WE SECURED EVEN TEMPERATURES THROUGHOUT THIS 14-STORY BUILDING WITH SARCOTHERM HEATING SYSTEM CONTROLS,"

say Slingerland and Booss, architects and engineers

New York's "Avon House," completed in 1957. Architects and Engineers: Slingerland and Booss, 120 Greenwich Street, N. Y. C.

Mechanical Contractors: Fein-Schlosberg, Inc., 1770 Second Avenue, N. Y. C. Owner: The Ten Men Realty Co., Leon Finley, President, N. Y. C.

In the superbly appointed "Avon House" apartments at 340 East 74th Street, New York, the complete automatic heating control job is Sarcotherm. The architects and engineers, Slingerland and Booss, called on Sarco's experienced engineering department to work with them and the mechanical contractor in working out components—controls, vacuum pumps and steam specialties. Besides setting up undivided responsibility of one manufacturer, this policy assured a balanced system with no weak links.

Accurate orifice calculations by Sarcotherm insured proper distribution of subatmospheric steam in the system, even in mild weather. Each of the 2 zones of this building is controlled by a Sarcotherm Continuous Flow Modulating Steam Control Valve. These valves meter the steam to furnish proper heat at any given outside temperature. Control Valves are influenced by outside temperature, wind velocity, and solar radiation, plus differential steam pressure between supply and return mains. A Master Control Panel supplies complete programming operation with automatic control for day, night and morning pickup cycles.

There is ample testimony to the sound judgment of the architects in making this a complete Sarcotherm vacuum heating control system. Since its first day of operation the installation at the new Avon House has been 100% trouble-free.

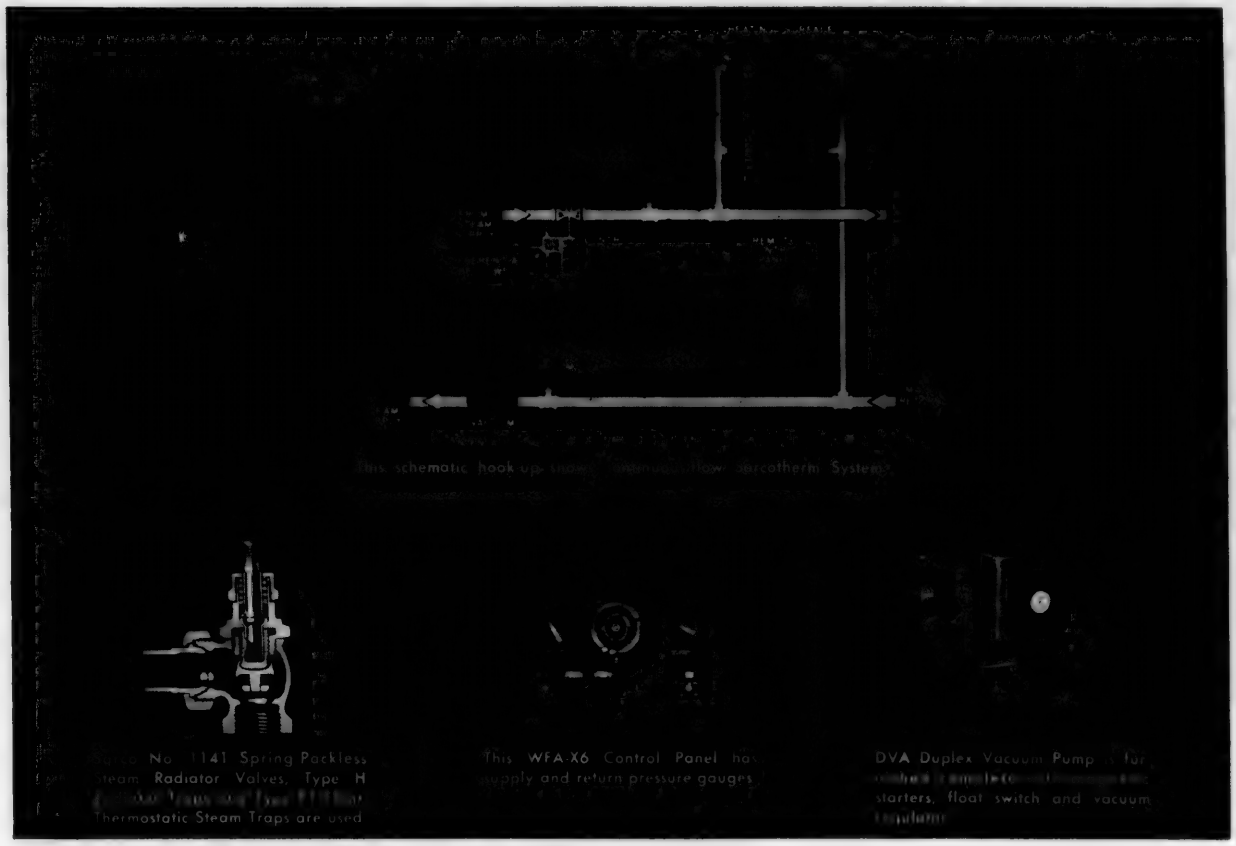
SARCOTHERM

An Affiliate of SARCO Co., Inc.

635 Madison Avenue, New York 22, N. Y.

6181-B

"INSTALLATION WAS EASY, THANKS TO SARCOTHERM ENGINEERING SERVICE AND UNDIVIDED RESPONSIBILITY FOR CONTROLS, SPECIALTIES, PUMPS," *say Fein-Schlosberg, Inc., mechanical contractors*


This schematic hook-up
Thermostatic Steam Traps are used
This WFA-X6 Control Panel has
supply and return pressure gauges
DVA Duplex Vacuum Pump
starters, float switch and vacuum

Marked advantages were found by the mechanical contractors in the quality of orifice engineering provided by Sarcotherm. Every valve, for example, was calibrated and the orifice plate brazed in at the factory. All units were tagged, unit-packaged, and keyed in with the hook-up drawing. The installation was supervised by Sarcotherm engineers. The installation was rapid and easy. No on-the-job adjustments were necessary.

SARCOTHERM

An Affiliate of SARCO Co., Inc.

*

FOR COMPLETE CONTROL SYSTEM CATALOG

write Sarcotherm Controls, Inc.,
635 Madison Ave., New York 22, N. Y.

6176-B

HUSKY TAKES THE TURNS

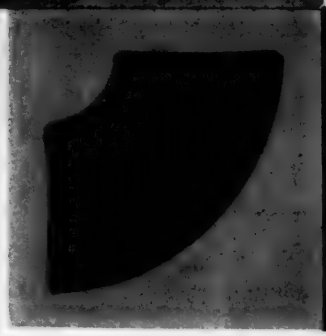
HUSKY
WELDING FITTINGS

—with strength to spare!

A WIDE MARGIN OF SAFETY

Unretouched photo at left shows that a **HUSKY** 4″ elbow has more than *eight times* as much strength as needed . . . even when Schedule 40 pipe is used at its maximum recommended working pressure. The pipe burst at 7,750 p.s.i.—but notice that our **HUSKY** elbow is still intact!

Perhaps even more important than its super strength is the **HUSKY** price, a 4″ elbow like the one shown costs about two-thirds as much as a regular specification elbow! **HUSKY** is the only steel welding fitting made specifically for low pressure piping. *Write for catalog and prices.*

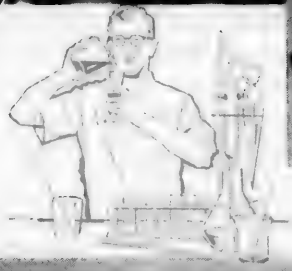


s shown here. It results from cold-flow working which compacts the metal for

stress in piping.

STEEL

NIBCO INC., Dept. JS-6310, Elkhart, Indiana



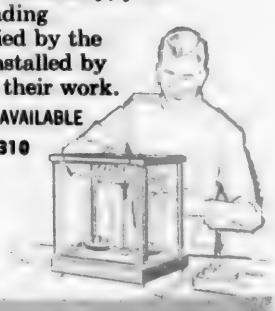
UNIFORM QUALITY

is the watchword at Nibco!

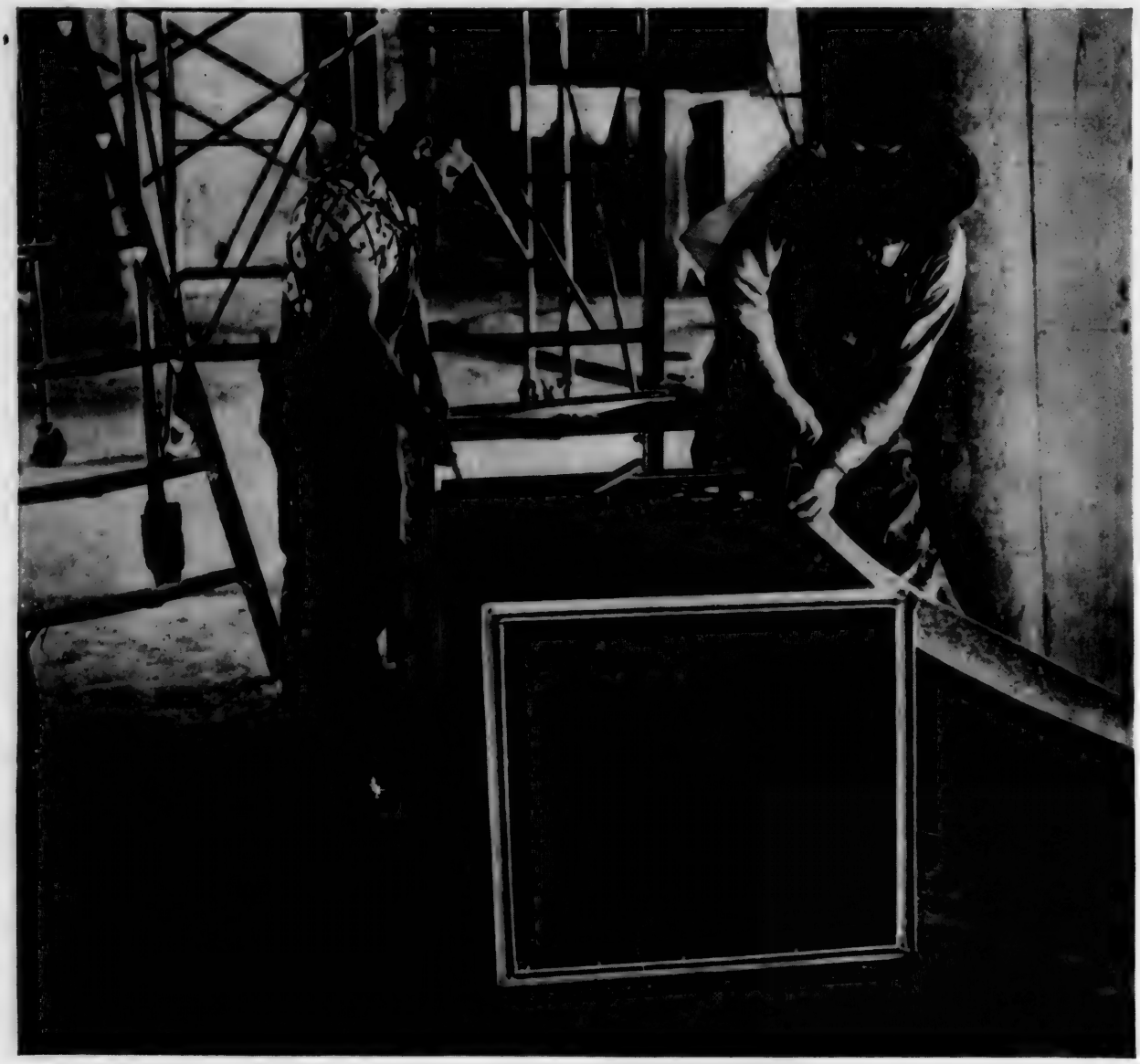
Exhaustive testing procedures and NIBCO's new automatic foundry (the only one of its kind) combine to make NIBCO red brass castings the most uniform copper tube fittings in the entire plumbing industry. To further insure uniformity, even the molding sand comes from the same pits that NIBCO has used for more than 30 years! When you want reliability, you want NIBCO . . . specified by leading architects and engineers, supplied by the nation's top wholesalers, and installed by contractors who can guarantee their work.

CATALOGS AND FURTHER INFORMATION AVAILABLE

NIBCO INC., Dept. J-6310
Elkhart, Indiana



NIBCO



Why the zinc stays on a Bethcon sheet

You can put Bethcon galvanized steel sheets through the toughest kind of forming without flaking or peeling of the zinc coating. Snap locks, Pittsburgh locks, or your own special seams—they're all the same to a Bethcon sheet!

That's because Bethcon is galvanized in Bethlehem's continuous lines, which bond the zinc extra-tightly to the base metal. With a Bethcon sheet, you'll find that the coating will go wherever the base metal goes, and come out just as sound as it started.

There's another advantage in Bethcon, too: the remarkable combination of ductility and strength in the sheet. This stems from the special annealing cycle in the continuous line. Bethcon sheets are neither too soft nor too stiff, but just right for easy workability and a sturdy end-product.

You can specify Bethcon in cut lengths or coils, in a wide variety of gages, with either copper-bearing (Beth-Cu-Loy) or plain open-hearth steel as the base metal. Our nearest district office will be glad to furnish additional details about Bethcon, or write direct to us at the address below.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Handling Hot Fumes? Bifurcate 'em!

A protective housing shields a DEBOTHEZAT Bifurcator motor from contact with hot and corrosive fumes. Special alloys for housings and fan wheels are available for extremely corrosive fumes. The result: smoother operation and lowered motor maintenance costs. In-the-duct installation of DEBOTHEZAT Bifurcator Fans saves valuable space and ends sharp-corner deflection of exhaust flow. Friction is reduced and velocity increased.

Direct-drive DEBOTHEZAT Bifurcator Fans economize fume removal problems in a wide variety of applications. Contact a DEBOTHEZAT engineer NOW.

De Bothezat FANS

A DIVISION OF

American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

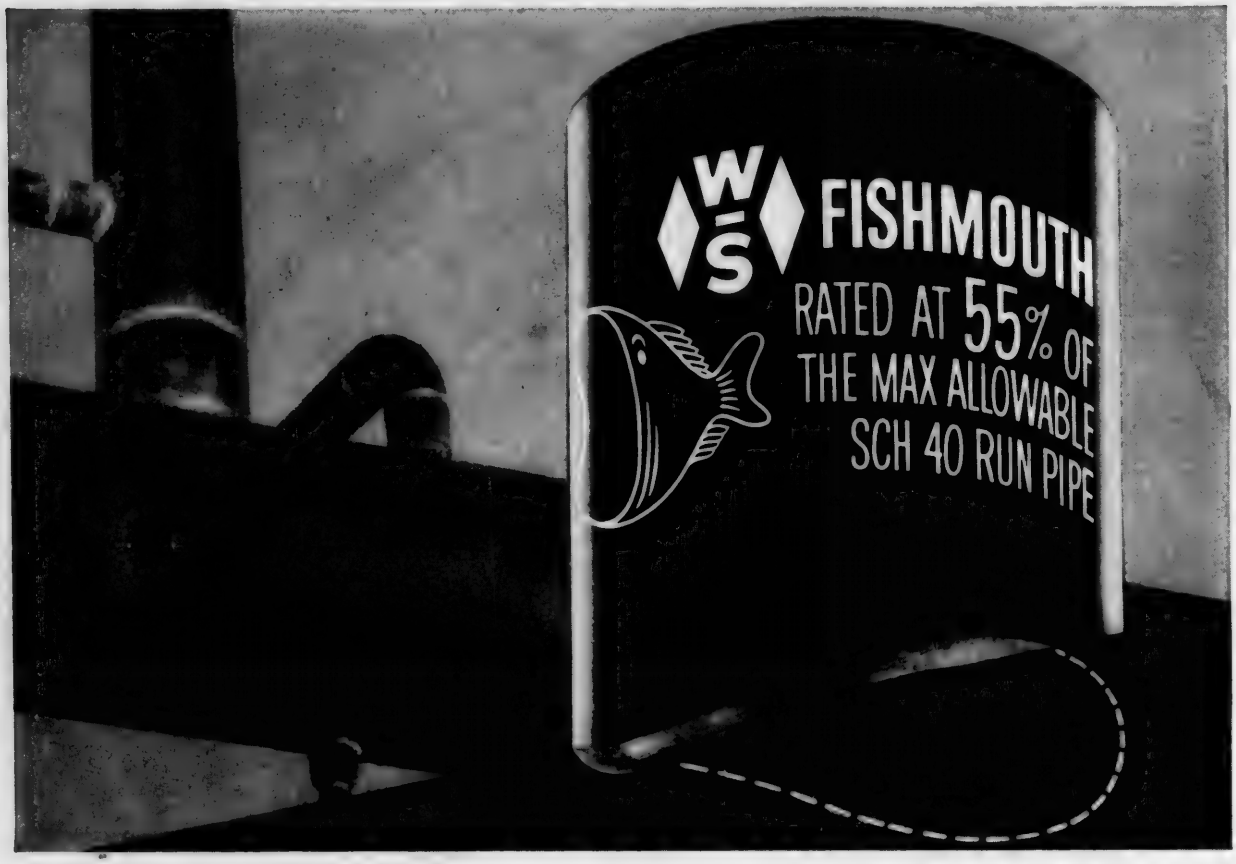
FOR FURTHER INFORMATION SWEET'S PLANT ENGINEERING FILE OR WRITE FOR COPY

IN CANADA: Represented by DOUGLAS ENGINEERING, LTD., Toronto • Montreal

FOR BRANCH CONNECTIONS 2 INCHES OR OVER:

Now! Only 81¢ for a 2" branch fitting!

THAT'S ALL A NEW, READY-MADE W-S FISHMOUTH COSTS



IT'S THE MOST PRACTICAL WAY TO MAKE A BRANCH CONNECTION

Mark

Cut

Weld

The W-S FISHMOUTH saves 50 per cent or more over commercially available branch fittings . . . *costs even less than your own field- or shop-made connection.* Made from Schedule 40 pipe, W-S FISHMOUTH is fully machined and perfectly shaped for strong, leak-proof joints. A ready-made W-S FISHMOUTH is rated for working pressures to 55 per cent of maximum run-pipe limits. Sizes: 2" to 12" IPS, butt weld ends. Fewer sizes handle many more jobs, eliminate need for special fittings.

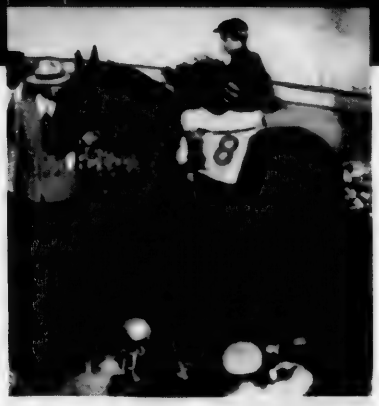
No time or cost required to shape, fit or bevel. Ideal for close-quarter work. Easy access to inspect weld penetration or to back-weld. W-S factory machining means a secure, permanent installation every time.

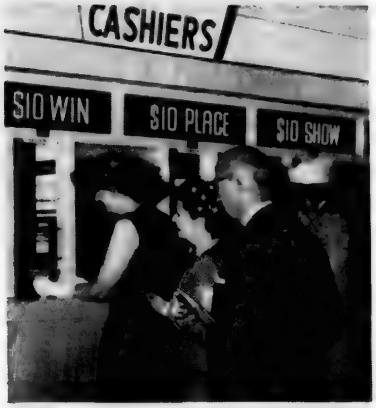
Ready-made, the W-S FISHMOUTH costs less to buy and install than anything you can buy or make. Write, today, for complete information, prices and names of distributors to: *Forge and Fittings Division, H. K. Porter Company, Inc., Box 95, Roselle, N. J.*

FORGE AND FITTINGS DIVISION **PORTER** ***H.K.PORTER COMPANY, INC.***

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD

In America's Newest and Largest Thoroughbred Track Powers controls the air conditioned areas in the 1050 ft. long grandstand. It is 10 stories high and 325 feet deep. It was designed to accommodate an attendance of 80,000.





D-19

NEW AQUEDUCT RACE TRACK, OZONE PARK, LONG ISLAND, N.Y.

Architects: ARTHUR FROEHLICH & ASSOCIATES, Philadelphia and Beverly Hills, Cal.
Engineers: STONE & WEBSTER ENGINEERING CORPORATION, New York
Mechanical Contractor: H. SAND & COMPANY, Inc., New York

POWERS Air Conditioning Control

at AQUEDUCT pays off in greater comfort, increased attendance and income

In the air conditioned spaces of this $33,000,000 track there's no gamble on thermal comfort – in summer or fall. The lounges, 25 bed hospital, all enclosed eating and drinking areas, the Turf and Field Club, board room and administration offices are regulated by a reliable Powers Pneumatic Control System.

Proper temperature and humidity conditions are assured during the cooling and heating season by Powers control of multi-zone and single zone air conditioning units. A Powers MASTROL System provides optimum comfort during the heating season by varying the hot water heating supply temperature in accordance with changes in outdoor temperature.

For Your New Building – the best insurance for dependable year after year temperature control is a time proven Powers Pneumatic System of Air Conditioning Control. It is lowest in annual cost of ownership.

POWERS CONTROL

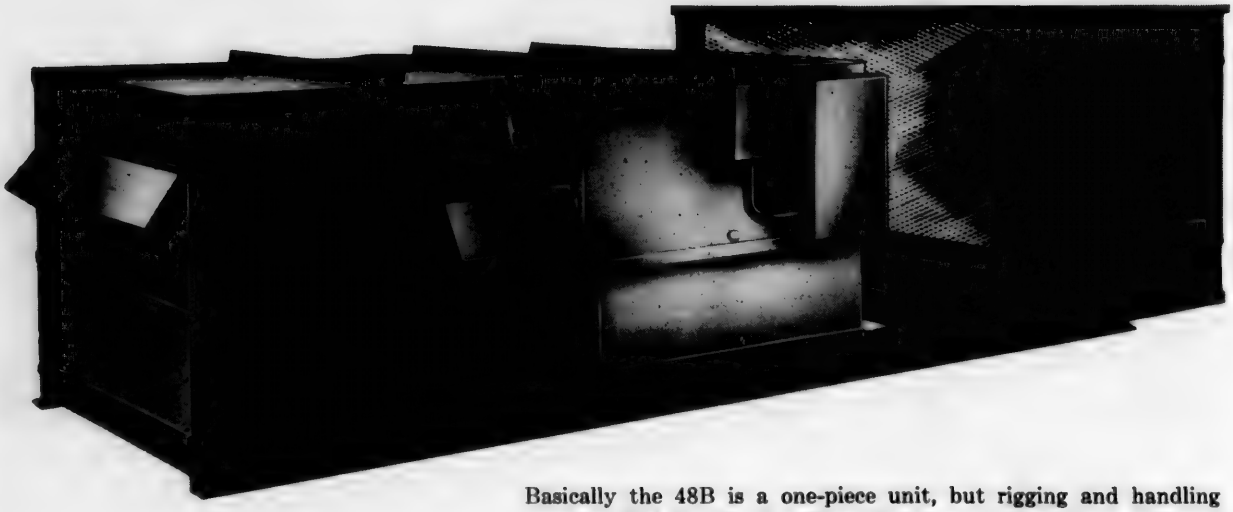
THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in 85 cities in U.S.A. and Canada*

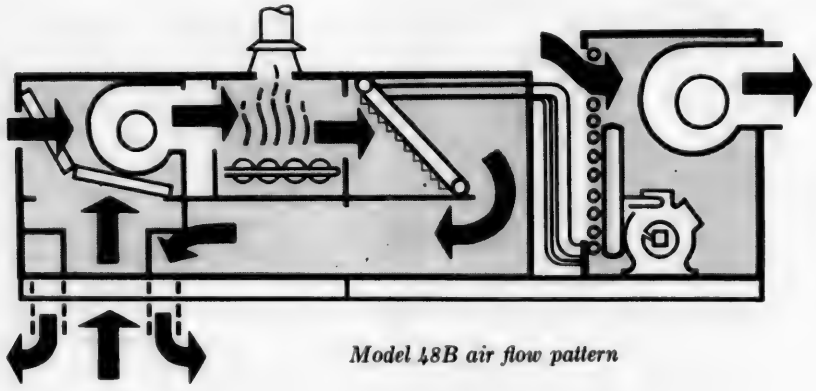
68 years of Automatic Temperature and Humidity Control

CARRIER AGAIN MAKES HEADLINES WITH A

NEW ROOF-TOP



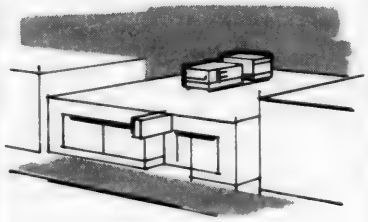
Basically the 48B is a one-piece unit, but rigging and handling are simplified by shipping the unit in two sections (base unit and fan section). It also installs with a single supply and return air duct, so only one duct passage must be cut through the roof. Installation is further simplified with only a single electrical power connection.



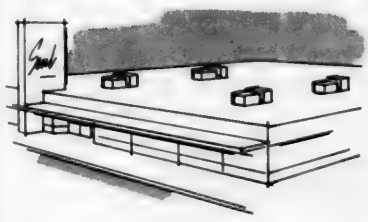
Model 48B air flow pattern

COMMERCIAL WEATHERMAKER

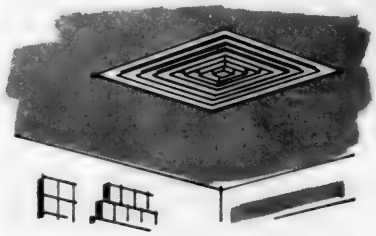
Puts both heating and cooling outdoors. Occupies no valuable floor space. Uses only a minimum of ductwork. Permits closer estimates, faster installation.



A single unit will both heat and cool a small store or plant



Larger buildings require two or more units to heat and cool



One supply and return air grille fits flush to ceiling

Here's the latest advance in heating and cooling for one-story buildings—the new Carrier 48B Air-Cooled Weathermaker*. Designed for roof-top installation, it provides the benefits of year-round air conditioning without extensive ductwork, without cluttering up ceilings and without tying up one inch of floor space. It gives you the opportunity to make closer estimates, reduces installation time and permits more installations with the same crew.

This versatile unit consists of a gas-fired heating section, a fan section and an air-cooled refrigeration section for cooling—all enclosed in a weatherproof casing and mounted on rails. Two capacities fit most heating and cooling requirements—7.5 and 10 tons for cooling; 200,000 and 250,000 Btus for heating.

The unit is factory charged, and refrigerant piping is installed. The compressor is protected by a five-year warranty. For more information call your Carrier dealer, listed in the Yellow Pages. Or write Carrier Corporation, Syracuse 1, New York.

*Reg. U.S. Pat. Off.

MORE PROOF OF
BETTER AIR CONDITIONING FOR EVERYBODY EVERYWHERE

Carrier

Oak Park School,
Laurel, Mississippi

SUPERINTENDENT OF SCHOOLS: J. M. Caughman.

ARCHITECT-ENGINEERS: John L. Turner & Associates, Jackson, Miss.

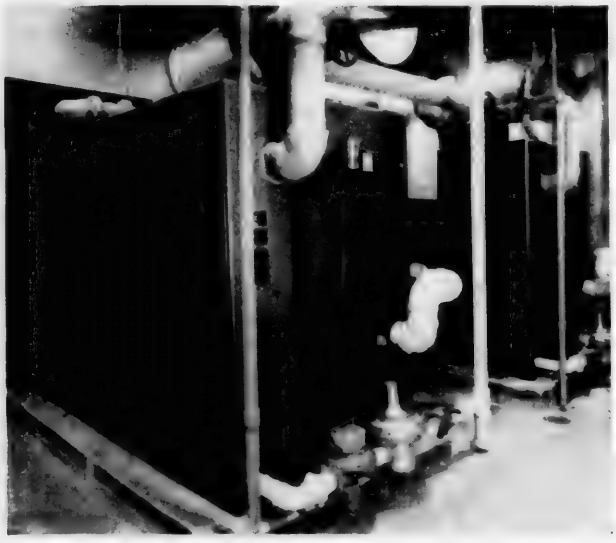
HEATING CONTRACTOR: McCaskill Brothers Plumbing & Heating, Laurel, Miss.

DISTRIBUTOR: Gene Arledge Company, Jackson, Miss.

MODERN SCHOOL ...MODERN BOILERS

Type "J" Boilers are available in these net I=B=R capacities:

Hot Water, 375,100—3,105,600 BTU/hr.
Steam, 1,565—12,940 sq. ft.



In selecting Weil-McLain Type "J" Gas Boilers for this school, the multiple advantages of the modern cast iron boiler received full recognition. Two J-21 boilers supply heat to both wings of the school and to the adjoining gymnasium. The sectional construction of these boilers is a particularly valuable feature as it permits easy adding of capacity in the event of school expansion.

There are numerous other specific reasons why Weil-McLain Type "J" Boilers offer the utmost in long-lived, dependable and economical heating—

1. Made of corrosion-resistant cast iron.
2. A.G.A. approved minimum efficiency of 80%.
3. Develop full capacity as rated by I=B=R.
4. Compact design saves space—up to 40%.
5. A.G.A. approved for all gases.
6. Available with A.G.A. approved dual fuel manifold.
7. Electronic controls available as engineered part of unit.
8. Only a vent needed to carry off products of combustion.
9. Lower maintenance—easily cleaned, no refractories, no motors, fans, no tube replacement, no water treatment.
10. Can be assembled at any stage of building construction. Sections pass through ordinary door.
11. Wide range of capacities permits accurate sizing.

Write today for complete information or see listing in Sweet's Architectural File or Engineers' Product File.

WEIL-McLAIN

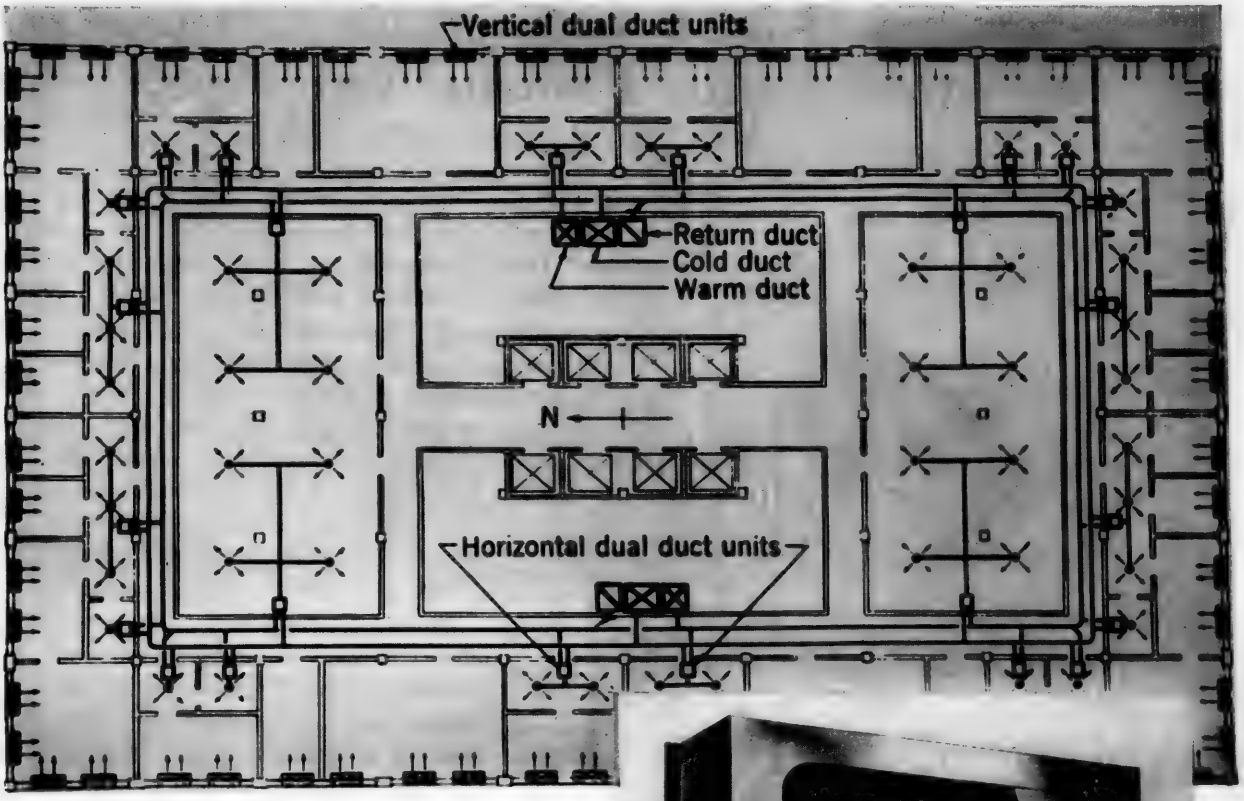
TYPE "J" CAST IRON GAS BOILERS

WEIL-McLAIN
BOILERS · RADIATORS

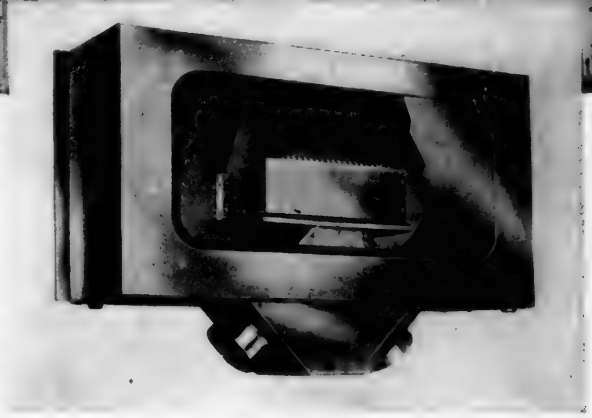
WEIL-McLAIN COMPANY
MICHIGAN CITY, INDIANA

Address literature requests to Dept. BB-109.

HOW TO "BALANCE A BUILDING" BEFORE IT'S BUILT:



Shown above is a typical office building dual duct layout, 100 per cent air system. It is zoned to provide selective temperature control for each enclosure with Buensod vertical dual duct units at exterior walls. These under-window units may be connected to vertical risers, or to horizontal mains at the ceiling or on the floor below.



Illustrated: Buensod Type V window-wall unit with cut-away showing automatic volume control. This unit is designed for installation under windows to discharge vertically upward, quietly and without draft.

Balancing a building before it's built . . . almost an incongruity, yet Buensod does it consistently. Buensod air mixing units can be pre-set at the factory for desired volume and guaranteed within ±5% when installed. Whenever desired, a change in air volume may be made in the field by simple adjustment of one nut. This practically eliminates the tedious job of balancing after installation . . . a chore which can take months.

The secret is in Buensod's proven Automatic Volume Control. A simple tent-like apparatus maintains constant air quantity from each unit regardless of variance of static pressures on either inlet or outlet of mixing valve. This operates automatically . . . independent of any outside power source, sensing instrument or complicated linkage arrangement. The mixing valve is actuated by a local thermostat to provide the desired room temperature.

Buensod units are being designed into a constantly increasing number of new and renovated structures. Consider them for your next project.

BUENSOD DUAL-DUCT

Write for details to: BUENSOD-STACEY

Buensod-Stacey, Inc., 45 West 18 Street, New York 11, New York

As functional as it is attractive . . .

New H. J. Heinz research center is another endorsement for Transite® Vent Pipe!

Architects and Engineers: **Skidmore, Owings & Merrill**
Partner in Charge: **Gordon Bunshaft**
Consultants on Mechanical Engineering: **Jaros, Baum & Bolles**
General Contractors: **George A. Fuller Company**

Photo by Ezra Stoller

Visit the H. J. Heinz Company's new Research Center and you see a strikingly attractive structure . . . *and every bit as functional!* Here—every design detail, every material used contributes to greater scientific productivity.

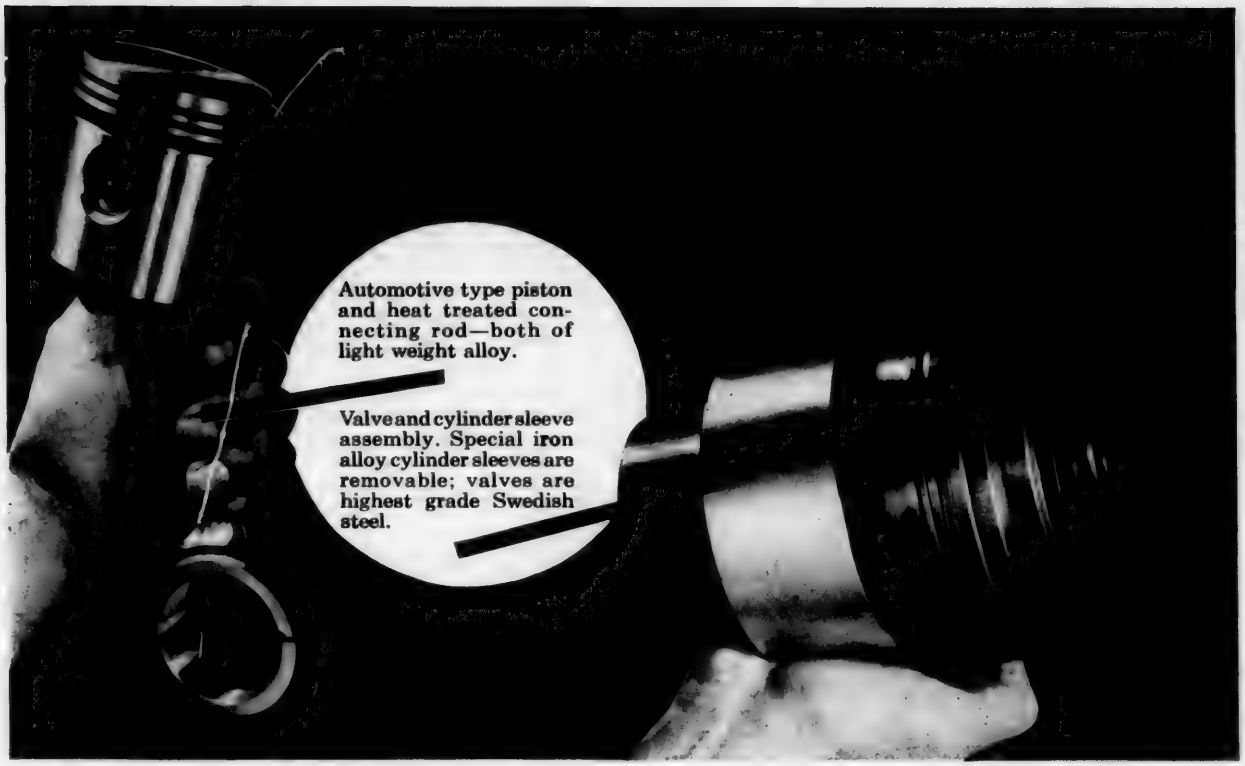
Within the many laboratories—equipped to test foods for taste, aroma, color, appearance—there's a marked accent on cleanliness. Every piece of equipment is planned to prevent contamination, to stay clean and rust free. That's why corrosion-resistant Transite Industrial Vent Pipe was chosen to vent every one of the Research Center's laboratories.

Whether used indoors or out, Transite offers you many advantages. Made of asbestos-cement, Transite retains its original, attractive appearance. *Saves on upkeep* because it never needs painting or preservative coating. *Saves on maintenance* because it resists the attack of most gases, mists, fumes and dusts . . . is unaffected by weather.

For further information on Transite Industrial Vent Pipe, write to Johns-Manville, Box **14HV**, New York 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS


Automotive type piston and heat treated connecting rod—both of light weight alloy.
Valve and cylinder sleeve assembly. Special iron alloy cylinder sleeves are removable; valves are highest grade Swedish steel.

You'll seldom need to service a B&G Compressor —but when you do, all the parts needed *can be carried in two hands.* Piston and rod assembly, and valve and cylinder assembly *will handle 95% of all B&G compressor repair problems!*

B&G Compressors are completely new in conception—*not* adaptations of 20-year-old designs. B&G engineering has created a compressor basically superior because it's basically simpler. These compressors have fewer maintenance problems, because they have fewer parts.

Add to this new superior design, *precision manufacture*—with every major part made and guaranteed by Bell & Gossett. The result is a compressor unmatched for efficiency, quiet operation and freedom from vibration. *Any vibration is no greater than that of a well balanced electric motor.*

B&G Compressors are incorporated in all B&G Package Liquid Coolers and Condensing Units. They can be equipped with multi-step capacity control systems...standard equipment includes gas and oil equalization ports, magnetic plugs and oil sight glass.

For greater efficiency, greater value per dollar, specify B&G Compressors and Refrigeration Equipment. Send for complete file of specifications and application data on B&G Air Conditioning and Refrigeration Equipment.

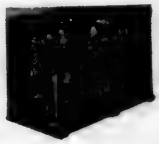
BELL & GOSSETT
COMPANY
Dept. RFX-4, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

COMPLETE LINE OF REFRIGERATION AND AIR CONDITIONING "PACKAGES" AND COMPONENTS

B&G Evaporator

B&G Centrifugal Pumps

B&G Condenser


B&G Package Liquid Cooler

Perfect air diffusion for electronic computers with ANEMOSTAT AIR DIFFUSERS

High heat return from computer equipment and from high intensity lighting is efficiently controlled by air diffused through scientifically designed Anemostat Air Diffusers.

Anemostat Air Diffusers change the air in a room *once every minute* without a draft. As a result, equipment and technicians operate at peak efficiency in this comfortable thermal environment.

Write for your copy of ANEMOSTAT Selection Manual 60 which contains data on the wide-range ANEMOSTAT line.

ANEMOSTAT.®

DRAFTLESS *Aspirating* AIR DIFFUSERS

ANEMOSTAT CORPORATION OF AMERICA

10 East 39th Street, New York 16, N. Y.

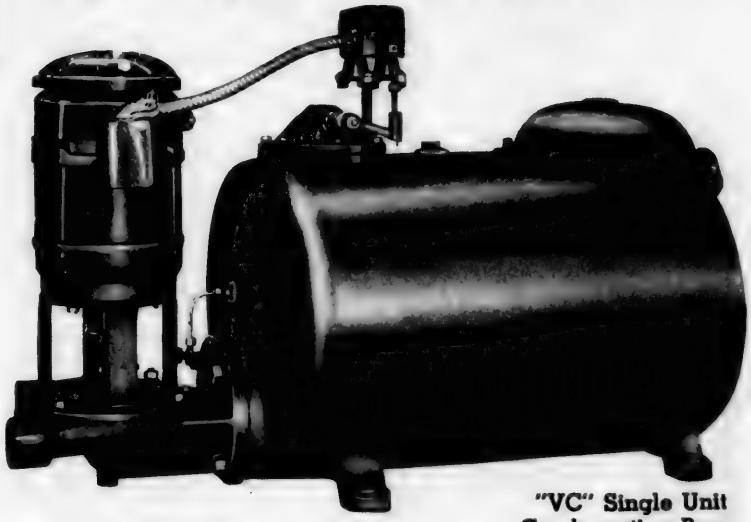
Representatives in Principal Cities

Specify SKIDMORE

FOR PUMP PERFORMANCE NOT PUMP PROMISES

TWO OUTSTANDING SKIDMORE PUMPS THAT HAVE STOOD THE PERFORMANCE TEST!

1 Easily Accessible • • • • • • Compactly Designed



"VC" Single Unit Condensation Pump

2 Close-Coupled • • • • • • Mechanical Shaft-Sealed

"CCVS" Single Unit Vertical Pump

There's a Skidmore Pump designed for each and every heating requirement.

Write for Bulletins

SPECIFY WITH CONFIDENCE

SKIDMORE PUMPS

SKIDMORE CORPORATION ST. JOSEPH, MICHIGAN

422 Reasons Why...

YOU CAN "DESIGN" YOUR OWN AIR CONDITIONING AT . .

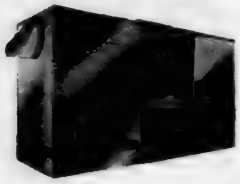
Governair

©SATISFABRICATED" TO SUIT YOUR REQUIREMENTS

Self Contained Unit
Water Cooled Condenser Type SCD

From 11 Basic Models
30 Possible Combinations

Self-Contained Unit
Multi-Zone Type SCMZ

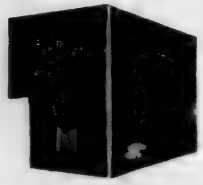


From 11 Basic Models
50 Possible Combinations

Self-Contained Unit
Shell and Tube Type ST

From 13 Basic Models
25 Possible Combinations

Self-Contained Unit
Multi-Zone Type STMZ

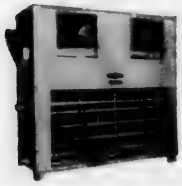


From 13 Basic Models
25 Possible Combinations

Horizontal Air Conditioner
Type GHC

From 14 Basic Models
56 Possible Combinations

Vertical Air Conditioner
Type GVC

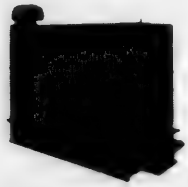


From 14 Basic Models
56 Possible Combinations

Multi-Zone Air Conditioner
Type GMZ

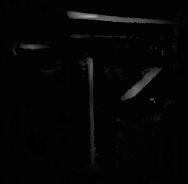
From 6 Basic Models
84 Possible Combinations

Evaporative Condensers
Type EC



From 14 Basic Models
28 Possible Combinations

*ChillPak Water Chiller
Type CPS



From 10 Basic Models
68 Possible Combinations

*Cabinet models available with built-in or remote evaporative condenser.

ORIGINATORS AND DEVELOPERS OF COMPLETELY PACKAGED AIR CONDITIONERS

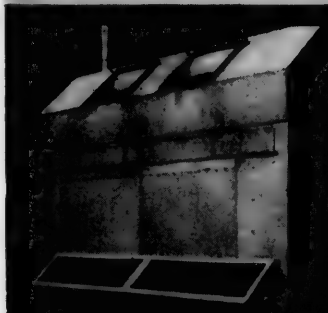
NATIONAL REPRESENTATION IN PRINCIPAL CITIES. SEE YOUR LOCAL YELLOW PAGE PHONE DIRECTORY.

GOVERNAIR

WRITE FOR FURTHER INFORMATION ON ANY SPECIFIC UNIT, OR SEE OUR LISTING IN ASHACE "GUIDE."

4840 N. SEWELL • OKLAHOMA CITY, OKLAHOMA

How Fafnir Ball Bearings simplify design and assembly for Frick

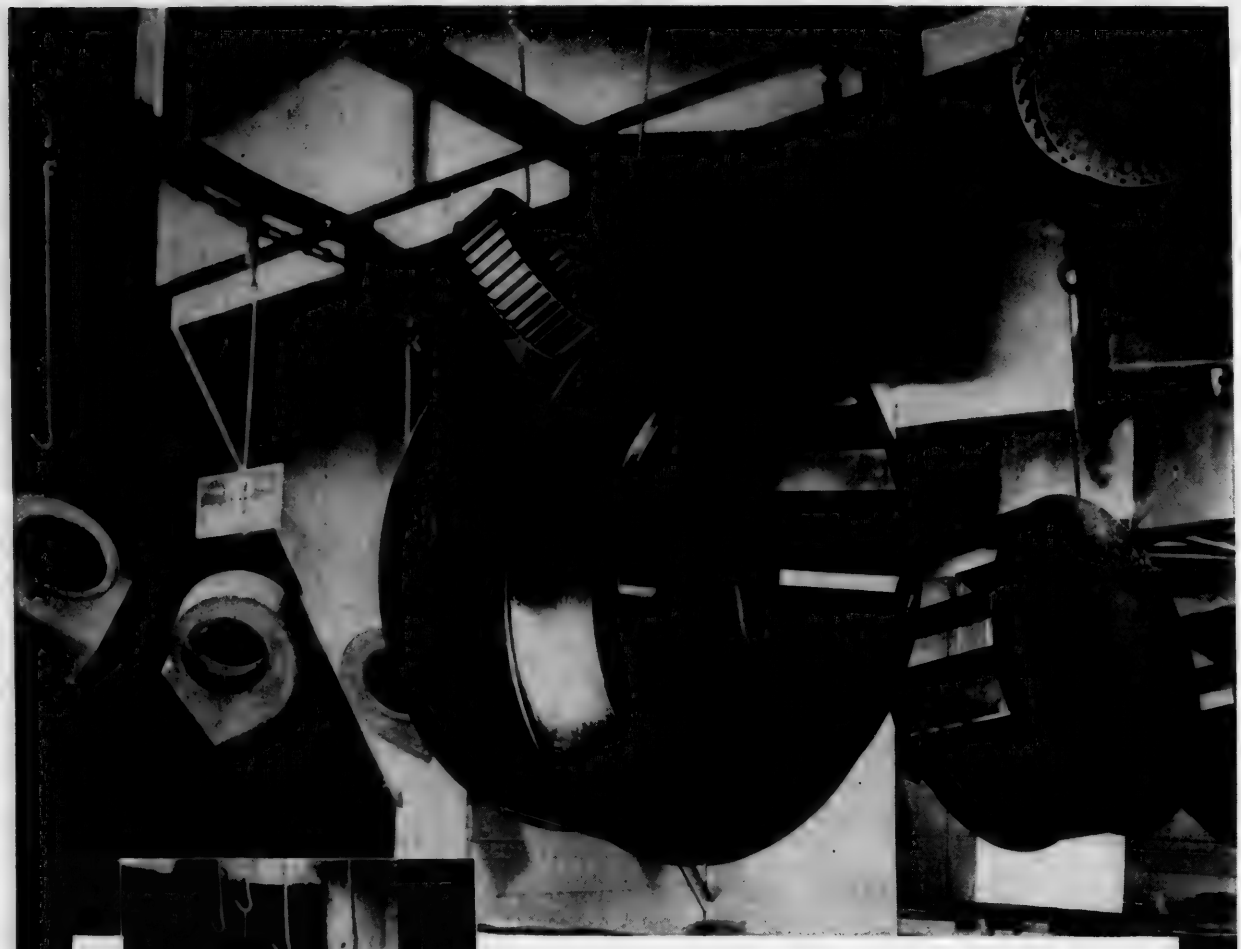


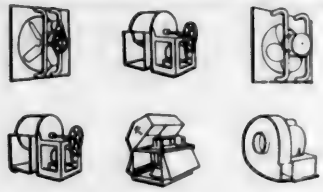
Prefabrication of components and sectional construction permit cost-cutting, job-tailored installations of Frick evaporative condensers (shown at left) and air cooling units (right). Air cooling equipment features "greatest amount of cooling work in smallest space." Frick evaporative condensers can save up to 95% of cooling water where systems do not include spray ponds or cooling towers.

When designing-in fan shaft bearings for their air cooling units and evaporative condensers, Frick Company wanted positive protection against moisture. Fafnir Wide Inner Ring Ball Bearings with Plya-Seals not only afford a built-in answer, but meet several other design needs as well. ✓ ✓ ✓ For example, the patented, contact-type Plya-Seals do double duty. Besides providing the best protection yet against moisture and other contaminants, they also prevent loss of factory-packed lubricant . . . thus cutting maintenance to a minimum. Assembly costs are cut, too. Bearings slip-fit onto shafts and are locked into place with a twist of Fafnir-originated, eccentric cam design, self-locking collars. No machining, no mounting devices needed. Moreover, wide bearing design assures ample support for the extra-heavy shafts. ✓ ✓ ✓ Such job-right applications make Fafnir a leading supplier of ball bearings for refrigeration, air conditioning, heating, and ventilating equipment. It adds up to experience that can pay off for you! The Fafnir Bearing Company, New Britain, Connecticut.

Fafnir Wide Inner Ring Ball Bearing with Plya-Seals. Flared, Buna-N rubber-impregnated fabric seals ride in constant contact with ground inner ring. Seal back-up shields, mounted in close clearance with inner ring, provide baffle for grease; prevent seal push-in. Bearing is prelubricated, relubricatable.

FAFNIR
BALL BEARINGS





SEE OUR CATALOG IN SWEET'S

how the *Peer* is put in *Peerless Electric*®

• Cleaning and painting Peerless Electric Fan and Blower units is one of the most important protective operations in the manufacturing process. All metal is cleaned chemically to insure a good paint bond that won't chip and cause rusting. The cleaning and painting facilities are completely automated. Parts move from cleaning to painting in a few minutes. All units have a phosphatized finish—a cousin to bonderizing. Special finishes, for resisting acids, etc., are available when specified.

WRITE TODAY FOR CATALOGS!

FAN AND BLOWER DIVISION

THE *Peerless Electric*® COMPANY

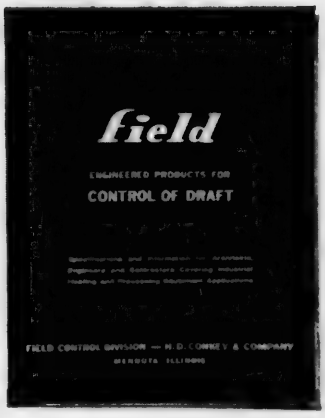
Also Manufacturing The Massachusetts Line®

WARREN, OHIO

Member of the Air Moving and Conditioning Association, Inc. (AMCA)

If you design, specify, install or service heating equipment you will find these technical brochures on the control of draft an important aid.

May we send you copies?



Handbook and Installation Guide

field

FIELD CONTROL DIVISION

H. D. Conkey & Company — Mendota, Illinois

AFFILIATES

Conco Building Products, Inc. — Brick, Tile, Stone
Conco Materials Handling Division — Cranes, Hoists
Spartan Tool Division — Sewer Cleaning Equipment

Specification Guide

What can a National Tube Distributor do for you?

PLENTY! Because he offers you time-saving as well as money-saving advantages. For instance: he gives you immediate delivery; he is a single, complete source of steel tubular materials; he offers you valuable engineering and technical assistance; and he constantly gives you new product information.

When you buy USS National Pipe from one of our distributors, you're getting a product that is the consistent choice of architects, engineers and contractors for all-round use in every type of building and industrial application. And, it has been for over 60 years. That's why National Pipe is the largest selling pipe in the world. We make a quality product . . . have excellent distribution.

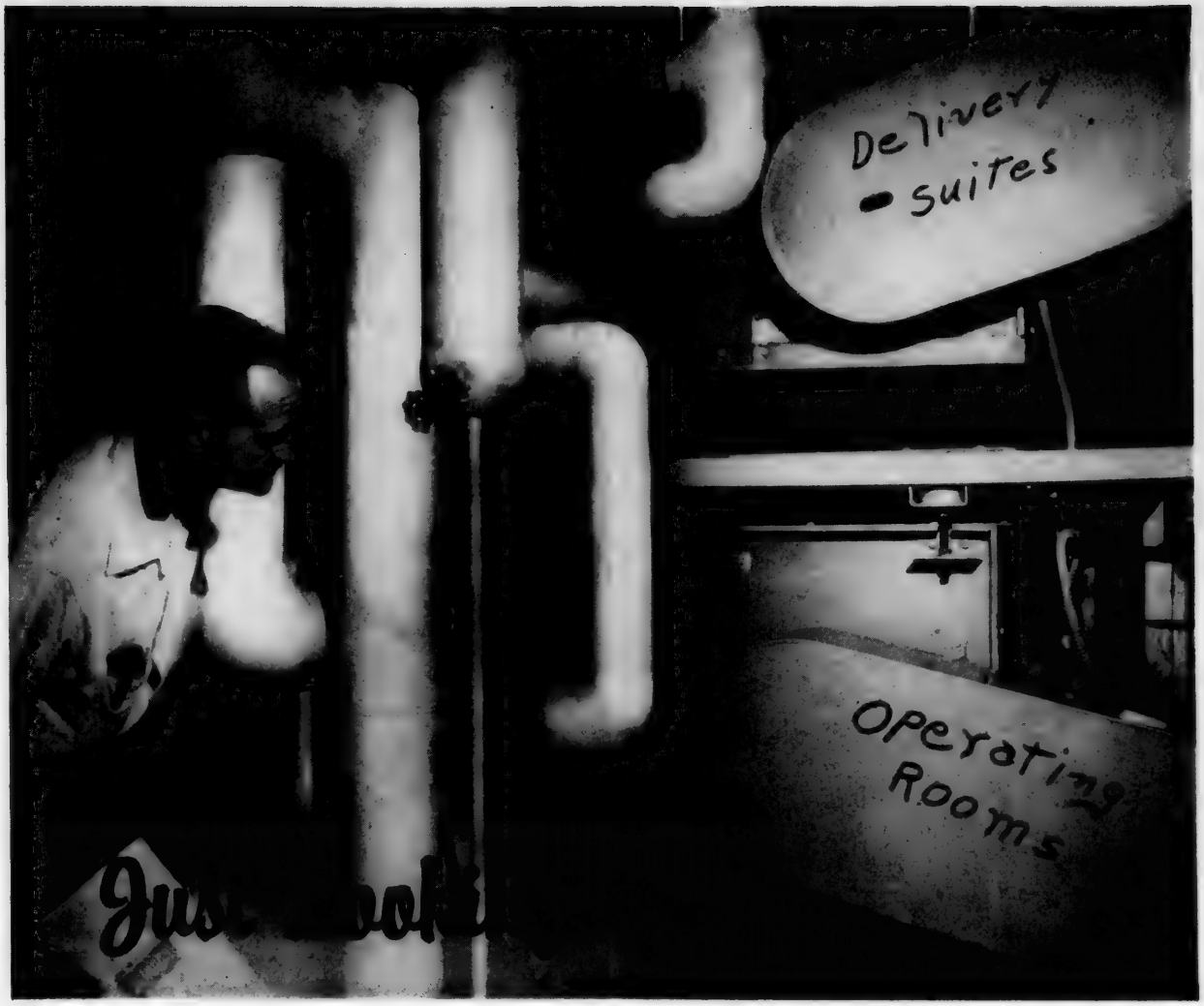
So, why not combine the fast, dependable service and technical assistance of a National Pipe Distributor with USS National Steel Pipe. Remember, you're getting the best pipe and the best pipe service money can buy. See your National Pipe Distributor . . . SOON!

USS and National are registered trademarks

The world's largest and most experienced manufacturer of tubular products

National Tube Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Export Company, New York



Goddard Hospital finds Dunham-Bush Air Conditioning needs no nursing

That's right! You can install Dunham-Bush Air Conditioning (and Heating) equipment and forget about it. And what's more, it's business-as-usual while Dunham-Bush equipment is being installed in modernization projects.

In vital hospital areas, such as the Operating Rooms and Delivery Area of Goddard Hospital, Brockton, Massachusetts, dependability counts.

That's why the Goddard building team of Ainsworth & Atwood, Architect; A. Ehrenzeller, Consulting Engineer; Miles Plumbing & Heating Co., Contractor; A. E. Borden Co., Wholesaler; Earl Anderson, Plant Engineer; picked Dunham-Bush equipment.

At Goddard, dependably on the job, is a Dunham-Bush Package Chiller–Cooling Tower–and Air Handling Units . . . a complete system from one source–one responsibility.

For performance and economy, it'll pay to ask your nearby Dunham-Bush sales engineer to talk it over with your building team.

Dunham-Bush, Inc.

WEST HARTFORD 10 • CONNECTICUT • U. S. A.

DUNHAM-BUSH

AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

at Award Winning Linton High School...*

RIC-WIL was specified and installed for the underground piping system

Architects: Perkins and Will; Ryder & Link
Consulting Engineer: E. R. Gritschke
Contractor: Tougher Plumbing & Heating Co.

RIC-WIL is indeed proud to be a part of the Linton High School Project. All of the firms participating in the annual awards are to be congratulated and encouraged in promoting better design of educational buildings. For over 49 years RIC-WIL has supplied the distribution piping systems for educational buildings through the United States, Canada and many foreign countries. These piping systems have proved to be the finest in Thermal efficiency and mechanical strength. Complete information is available on the many types of systems. Write, wire or phone for literature.

* School Executive and Educational Business Magazines annual award for Architectural and Engineering excellence. Linton High School, Schenectady, New York.

See our catalog in Sweets

Quality Piping Systems . . .
. . . of Exceptionally High Thermal Efficiency
SINCE 1910

RIC-WIL PREFABRICATED INSULATED PIPING SYSTEMS

CENTRAL OFFICE: RIC-WIL INCORPORATED, BARBERTON, OHIO
WESTERN STATES: WESTERN RIC-WIL COMPANY, NEWARK, CALIF.
IN CANADA: THE RIC-WIL COMPANY OF CANADA LIMITED

They compared efficiency, permanence, and applied cost ...and bought ULTRALITE®

FOR INFORMATION AND DELIVERY, CALL YOUR LOCAL ULTRALITE DISTRIBUTOR (LISTED IN THE YELLOW PAGES.)

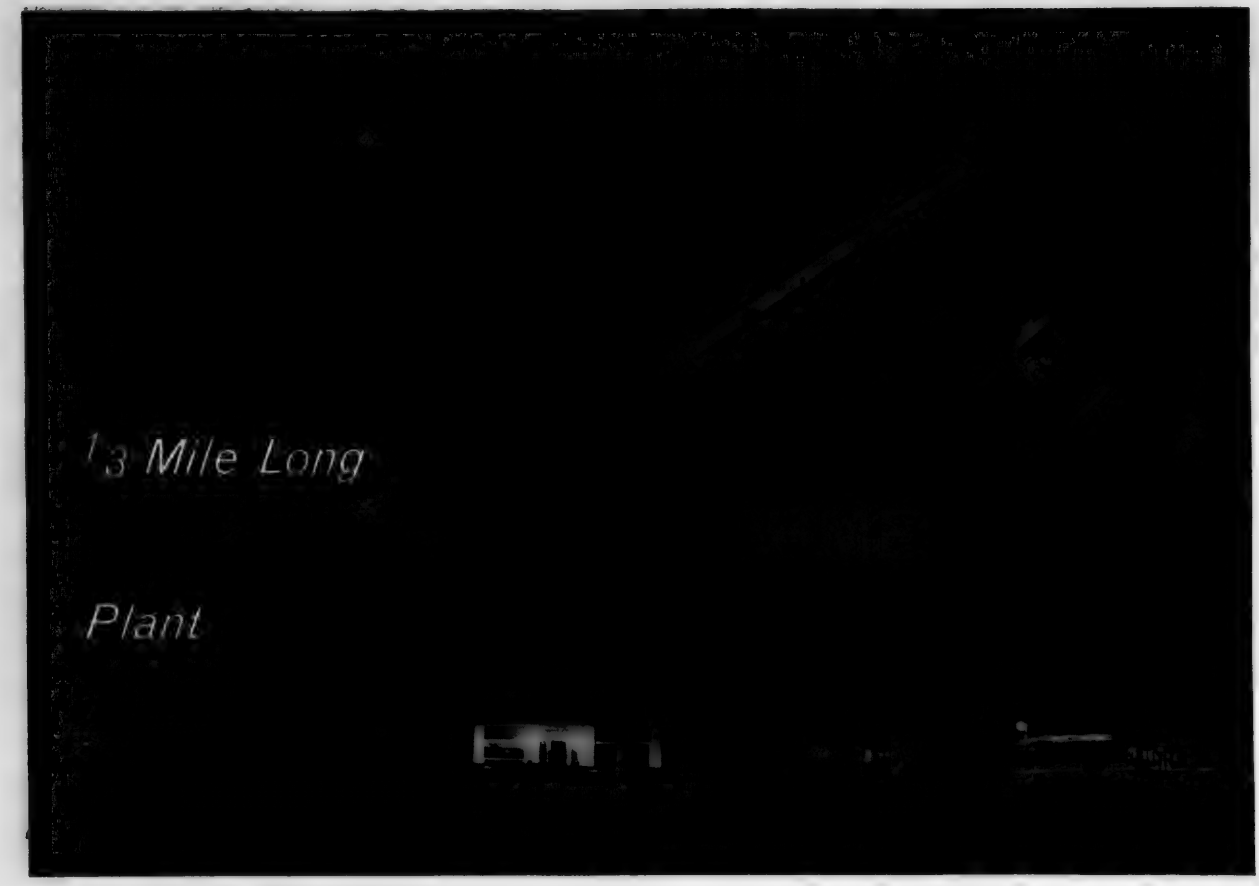
COMPARE APPLIED COSTS... and you, too will discover the economy and ease of installing ULTRALITE, the *only* duct insulation made exclusively of long, textile-type glass fibers. ULTRALITE'S long-staple strength assures more resilience . . . less likelihood of damage, both during and after installation . . . more uniform thickness for full insulating efficiency and a neater job. *Compare* . . . and you'll also find that ULTRALITE is outstanding in thermal and acoustical efficiency. For many of the same reasons, you'll want to try ULTRALITE glass fiber *duct liner*, too.

If you're interested in top performance at rock-bottom costs, next time use ULTRALITE, the only lightweight, low-density glass fiber insulation with a 12-year record of performance. You'll find it readily available in all major cities from local distributor stocks, plain or with a variety of factory-adhered facings that enhance appearance and prevent moisture penetration.

GUSTIN-BACON *Manufacturing Co.*

222 W. 10th St., Kansas City, Mo.

Thermal and acoustical glass fiber insulations . . . Molded glass fiber pipe insulation
Couplings and fittings for plain and grooved end pipe.



where dependability of pipelines is a must, control is entrusted to JENKINS VALVES

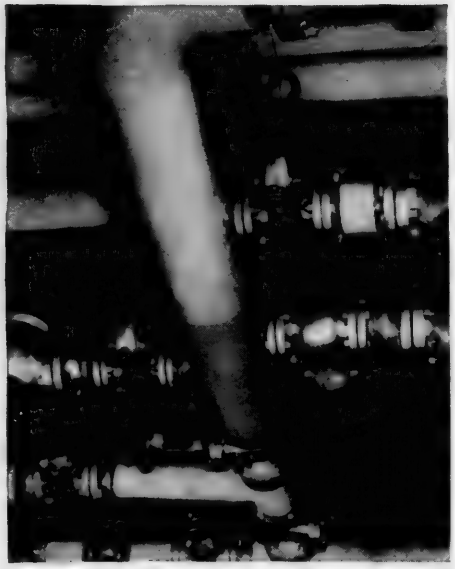
World famous Merck Sharp & Dohme, division of Merck & Co., Inc. not only knows pharmaceuticals and biologicals; they know a lot about valves. They need to! Control of pipelines must be *unfailing*.

That's why you'll find Jenkins Valves on all process pipelines in this West Point, Pa. plant . . . as well as on plumbing, heating and air conditioning lines.

The Jenkins name is not new to Merck Sharp & Dohme. They have been using Jenkins Valves extensively for the past twenty years. The unusually large number of valves installed in the company's seventeen domestic and foreign plants represents a big investment. So you can be sure this experienced valve buyer has found Jenkins Valves both dependable and maintenance free.

Jenkins dependability can save money for any plant or building. What's more, you can specify or install Jenkins Valves at no extra cost. Jenkins Bros., 100 Park Avenue, New York 17.

Sold Through Leading Distributors Everywhere



Jenkins Valves on main steam lines serving the Biological buildings

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864 Jenkins Bros.

Climate by Chrysler

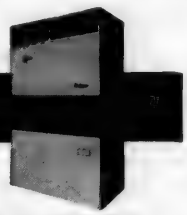
makes my client 17° cooler and 93% happier now!

"Why did I put Chrysler Packaged Air Conditioning in the specifications? For the many engineering exclusives it offers. For example, the new Power Miser compressor cuts operating and maintenance costs. And, the Maxi-Fin coil removes moisture faster. My client saves money. And his employees and customers are happier."

"Working is a pleasure here . . . with Chrysler Airtemp Air Conditioning. Whether it's 120° above, or 5° below—we've got Spring. That's *real* all-weather operation for you . . . and it's another Chrysler exclusive."

"Masterful engineering is just one of the reasons my building's got Airtemp. Chrysler's 25 years of leadership in packaged air conditioners assures dependability. With almost 300 models to choose from, I got exactly the right unit for my requirements. And it includes—as standard—safety features most manufacturers don't offer—even as extras.

Before you figure your next job, why not get all the facts and figures on Chrysler Packaged Air Conditioning. Contact your local Airtemp Distributor. Or write direct.



CHRYSLER
AIRTEMP

Airtemp Division, Chrysler Corporation, Dept. I-109, Dayton 1, Ohio
Canadian Distributor: Therm-O-Rite Products, Ltd., Toronto, Ontario

THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS

It's the Nash CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY
438 WILSON, SO. NORWALK, CONN.

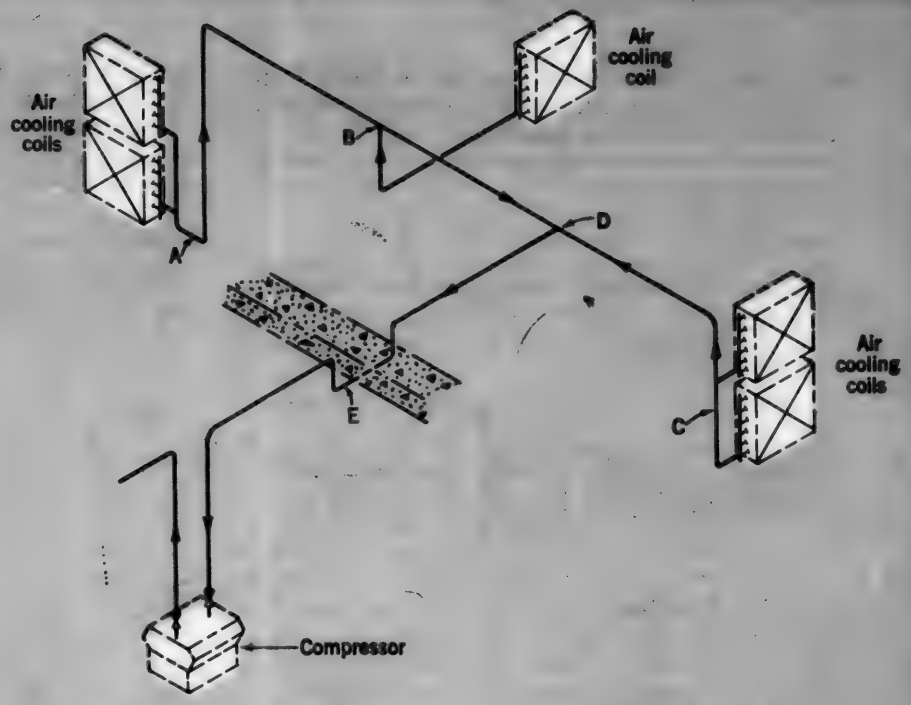


Fig. 1. Five examples of poor suction line design. After you have figured what should be done to correct these designs, turn to Fig. 2 and see what the author suggests for good practice.

Refrigerant Suction Line Piping

From Multiple Direct Expansion Coils

J. R. HARNISH
Engineer, York Division, Borg-Warner Corp., York, Pa.

This is the first of a series of articles which will cover various components of a refrigeration circuit. Examples will be presented of what the author considers poor piping design and also good design. Reasons are given for some of the features of an approved layout.

ON refrigeration systems, the design of long suction lines inter-connected with multiple direct expansion coils, probably creates more of a design problem than all of the other refrigerant piping combined.

Some of the problems encountered are:

1. Maintaining sufficiently high gas velocities through vertical risers to return oil.
2. Maintaining a continuous pitch toward the compressor throughout any horizontal run to return oil.
3. Avoiding unnecessary traps or dead-ended lines where oil can accumulate.
4. Special precautions to be taken when suction line may be located in cold ambient due to condensation during system shutdown.
5. Pressure drop limitation due to refrigeration capacity penalty.
6. Noise and vibration transmission.

Most of these problems are compounded when a number of direct expansion coils are installed at different locations. Longer suction lines are required, the building design will generally dictate the piping geometry, and penetrations through walls and occupied spaces will create more noise and vibration problems. For these reasons, it is strongly recommended that on multiple air handling unit systems, a chilled water refrigeration system be used in lieu of direct expansion air cooling coils.

System Must be Understood

However, many specifications are written around the direct expansion system and unless the contractor takes exception to the specifications, he is forced to bid the direct expansion system. Even when taking exception, he may frequently find that his installed price for the water cooling system may be out of line with his competition bidding the direct expansion system. This is often misleading since consideration should also be given to the costs involved in starting up the system, making piping and control changes and maintenance, as well as the life of the equipment.

In addition to new installations, there are many existing direct expansion systems causing operating difficulty. Recognizing some of the pitfalls that might be encountered can also be helpful in applying a "fix" to existing malfunctioning systems.

Poor Design

Figure 1 illustrates poor suction line piping from five direct expansion coils connected to the common suction line to the compressor. Where two or more coils are located in a single air unit, it is generally advisable to provide individual liquid line solenoid valves to control the operation of each coil. For lower load conditions, one or more of the solenoid valves may be de-energized to render its respective coil inoperative. The coils may be located for parallel air flow, or where humidity requirements are particularly critical, it is more desirable to locate the coils for series air flow.

Problems of a Common Riser

At location *A*, Fig. 1, the suction connections from both coils are joined together to form a loop and common riser for both coils. Unless both coils will always be operating simultaneously, this is a poor arrangement since reduced capacity operation, with only one coil operating, will result in low gas velocities through the vertical riser. Low velocities, of course, make oil return extremely difficult, particularly with Refrigerant-22. Also shown is a relatively long horizontal trap, which should be avoided due to the large volume of oil and refrigerant liquid that can collect here. Collection of these two items at this point can cause operating difficulties.

Moving to location *B*, the suction line from another coil enters the bottom of the common suction line. This should definitely be avoided since oil flowing through the common header can drain down this vertical riser, particularly when the single coil is inoperative or operating at a reduced temperature split.

The remaining two coils, location *C*, are poorly connected to a common vertical riser since oil return will again be difficult.

Problem of Turns

At point *D*, the gas flowing from either side of the tee must make a 90 degree turn. Any droplet of oil flowing with the gas or clinging to the pipe wall, tends to travel a straight flow path. Consequently, large quantities of oil can accumulate in a section of the header where the gas velocity is low. Oil flowing with the gas from the other section of pipe will collect in this dead-ended line and the compressor will gradually run out of oil. Furthermore, a sudden increase in gas flow through the line where oil has collected, will move a large slug of oil to the reciprocating compressor. Since the compressor is designed for gas flow, not liquid, valve breakage and/or other component failures may result.

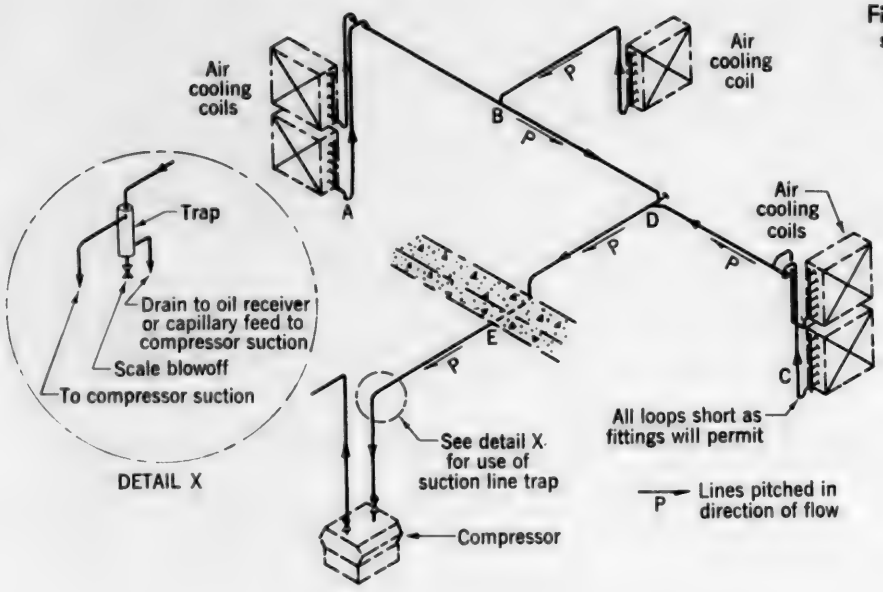


Fig. 2. Improved suction line design. Compare this with Fig. 1.

At location *E*, a suction line trap has been formed due to interference from an overhead beam. During reduced capacity operation, oil accumulation will result, the magnitude depending upon the size of the line and length of the trap.

What may appear to be a small trap in the suction line, may cause considerable grief. Consideration must be given not only to the operating cycle, but to what may occur when the system is shut down. Lubricating oils used in refrigeration compressors have the undesirable characteristic of absorbing the halocarbon family of refrigerants. Two ways of minimizing the quantity of refrigerant absorbed are:

1. To provide a source of heat to the oil to maintain its temperature above that of the ambient, and consequently the temperature of the refrigerant.
2. To pump down the pressure surrounding the reser-

voir of oil, thereby reducing its concentration of refrigerant.

Both of these precautions have been taken to keep compressor crankcases relatively free of refrigerant when the compressor is idle.

Unless a continuous pump-down cycle is provided, accumulations of oil in the suction line will, when the system is idle, absorb considerable quantities of liquid refrigerant. Several quarts accumulation of oil during the operating cycle may increase to several gallons of a refrigerant and oil mixture when the system is idle for any length of time. This phenomena makes it increasingly important that oil traps in the suction line piping be avoided.

Improved Design

Figure 2 illustrates an improved suction line design which will overcome many of the problems encountered with the design illustrated in Fig. 1. The likelihood of low gas velocities through the vertical riser at location *A* is overcome by providing individual risers from each coil to the common header before joining together. Thus, if one coil becomes inoperative at reduced load conditions, a sufficiently high velocity is maintained through the gas riser of the single operating coil.

Note that the loops or traps draining each coil are small to minimize the quantity of oil and refrigerant that can collect at these points. Each vertical riser loops above the common horizontal suction line before joining it. This prevents any oil drain-down to an idle coil. Another acceptable practice is to join the smaller vertical risers into the side of the larger horizontal header. This will permit the use of fewer fittings and will prevent gravity drainage since the takeoff connection will be at a higher elevation than the bottom of the horizontal header.

Long Line Avoided

At location *B*, the suction line from the single coil is looped above the top of the common horizontal header to prevent oil draindown to an idle evaporator. Also, only a small trap is provided to drain the coil and the vertical line rises immediately beyond the coil, thereby avoiding the long horizontal trapped line shown in Fig. 1.

The common vertical riser for the two coils at point *C* has been changed to include individual vertical gas risers from each direct expansion coil. Again the traps draining the coils are as small as the pipe or tubing fittings will permit and each vertical riser loops above the horizontal header.

Interconnecting Piping

The interconnecting piping at location *D* has been altered to prevent oil accumulation in a low velocity section of the horizontal piping. The horizontal header from each direction is elevated above the common header connected to the compressor. With a 45 degree elbow connecting each branch circuit to the common header, the oil is free to flow toward the compressor, even with no gas flow in another branch.

As the common suction line approaches the overhead beam or ductwork, it must duck underneath it to avoid interference. However, instead of rising upward again at *E*, this line should remain at the same elevation the remainder of the way to the compressor. Compare the designs shown in Figs. 1 and 2.

Note that all horizontal lines are pitched in the direction of flow to keep the oil in motion, even with relatively low gas velocities. Of course, the greater the pitch in these horizontal lines, the less operating difficulty might be expected. Approximately ¼ inch per foot is desirable, but for long lengths of run, this is frequently difficult to obtain due to limitations on head room and aisle clearance. At a minimum, ⅛ inch of pitch should be provided for each linear foot of horizontal run.

Suction Line Trap

On any system including complicated suction piping with multiple coils, as illustrated on Figs. 1 and 2, the use of a suction line trap for controlled oil collection is a good investment. Either a horizontal or a vertical trap may be used for this purpose. The vertical type is illustrated in detail *X*, Fig. 2.

Variable load conditions and complicated and lengthy piping will at times result in oil and/or refrigerant liquid slugging to the compressor. The suction trap is provided to absorb the liquid and prevent it from reaching the compressor. Even with well designed refrigerant piping, small liquid quantities at time flow through the suction line due to malfunctioning thermal expansion valves, operation at extremely low load conditions, compressor cycling, refrigerant condensation when the system is idle, etc.

Liquid collected in the suction trap may be drained by gravity to an oil receiver where a reservoir is maintained to replenish any oil pumped by the compressor. Where an oil receiver is not included, the trap may be drained directly to the compressor suction connection or crankcase. A small line or throttling device should be used to prevent excessive flow.

Cooperation Important

In summarizing, the preferred method of handling mechanical cooling with separately located air handling systems is by the use of a chilled water cooling system. If the direct expansion type system must be used, time will be well spent in analyzing the design of the suction line piping regarding operating problems that may be encountered both when the system is operating and when idle.

Furthermore, construction personnel should be properly briefed on the details of the piping intended. This requires close cooperation between the design engineer and construction supervisor. All too frequently, the job erector takes exception to drawing layout due to building interferences, efforts to save material and labor, and other causes. When the construction man is properly informed, he will adhere more closely to the piping drawings and will usually know what to do when physical conditions warrant deviation from the drawings.

Other Articles of Series

Articles in this series for early publication will illustrate and describe poor and good design of suction line superheaters, and suction line piping to parallel compressors.

New Uses for Evaporative Cooling

ROBERT S. ASH
Assistant to the President, International Metal Products Company, Phoenix, Ariz.

An engineering approach to show how evaporative cooling is practical for use in laundries and for providing relief where hot spot areas exist.

FOR over 20 years, evaporative coolers have been in common use to provide relief from the heat. They have found their biggest market in the states west of the Mississippi where the summer is characterized by high temperatures of long duration with less than average relative humidity. It is this latter factor that confines the use of evaporative coolers for comfort purposes to arid and semi-arid regions of the world.

An effective temperature chart will reveal, however, that the evaporation of water will always result in a lower effective temperature regardless of the relative humidity level. Effective temperature is an index that combines the effect of temperature, movement of air and humidity.

TABLE 1—CLIMATOLOGICAL DATA FOR CLEVELAND, OHIO

Date	Dry Bulb	Wet Bulb	W. B. Depr.	D. B. Lvg Evap. Cooler*	% R. H.	Effective Temperature Air Velocity FPM 100	300	500
				August				
1	82	71	11	74	58	71	68	65
3	82	71	11	74	58	71	68	65
4	88	77	11	80	59	77	75	72
6	82	66	16	71	43	68	64	61
7	80	68	12	72	53	68	65	61
11	81	66	15	71	44	67	64	60
12	84	68	16	73	45	69	66	62
13	86	73	13	77	55	74	71	67
14	86	68	18	74	38	70	66	64
20	80	64	16	69	43	65	61	58
21	87	66	21	72	33	68	65	62
22	84	66	18	72	38	68	64	62
23	84	67	17	72	43	68	65	62
24	84	69	15	74	47	70	67	64
25	86	65	21	71	31	67	64	61
26	90	67	23	74	30	70	67	64
27	92	69	23	76	32	71	68	66
28	90	68	22	75	33	70	67	65
29	94	67	27	75	24	70	67	65
30	94	70	24	77	30	72	70	68
31	96	77	19	83	43	79	76	74
				September				
1	95	74	21	80	37	76	73	71
2	98	75	23	82	34	77	75	73
3	98	73	25	81	30	75	73	71
4	92	73	19	79	41	75	72	70

* Probable outlet temperature, dry bulb, from evaporative cooler when wet bulb depression is 70% of that in preceding column and the dry bulb temperature is as listed in the second column.

Let us consider conditions of 95 deg DB and 75 deg WB because this set of conditions is usually considered the summer design standard in most areas. Through reducing the temperature 15 deg by evaporating water adiabatically, there is accomplished a reduction in effective temperature of 5.5 deg for air moving at 25 fpm and 9.5 deg for air moving at 700 fpm or an average of 7.5 degrees. This is in good correlation with the preceding statement that the effective temperature will be reduced approximately 50% of the dry bulb or wet bulb temperature reduction when there is no change in the other temperature component.

Furthermore, the reduction in dry bulb temperature through the evaporation of water has increased the effectiveness of the cooling power of the moving air in this example by over 100%. The effective temperature (based on this chart) varies from 83 deg at 25 fpm to 79.5 deg at 700 fpm; an effective temperature of 77.5 deg at 25 fpm drops to 70 deg at 700 fpm. In the former case, increasing the air velocity from 25 fpm to 700 fpm only resulted in a 3.5 deg decrease in effective temperature in contrast to a 7.5 degree decrease in effective temperature for the same range of air movement when water was evaporated.

Recognition of these relationships between air cooling through water evaporation and effective temperature can be put to practical use in providing relief cooling of hot areas with little regard to geographical location. Table 1 gives data for Cleveland, Ohio. August-September, 1953, was selected because there was a ten day period when the temperature was 90 degrees or higher each day. The dry bulb, wet bulb and relative humidity figures were taken from the local reports compiled by the Weather Bureau. The 1:00 p.m. figures were chosen because they were the highest of the four recorded daily readings. Dry bulb temperatures less than 80 deg were omitted. Effective temperature in no instance exceeded 79 deg and for air velocities of 500 fpm, 74 deg is the highest effective temperature—well below maximum permissible design condition for hot areas. Findings of the Bureau of Ships, Department of the Navy, indicate that sensible perspiration or sweating does not take place until the effective temperature is higher

This article was presented as a paper at the Air Conditioning Conference, Wright-Patterson Air Force Base, Dayton, Ohio, July 13-16, 1959.

than 78 deg for people lightly clothed. (The Textile Workers Union has adopted an effective temperature of 80 deg as their acceptable summer design maximum).

Air Force Regulation Number 91-8 specifies in the Table of Allowable Systems, mechanical ventilation for shops, laundries, dry cleaning plants, bakeries and kitchens. These are areas that are economically impractical to cool using mechanical refrigeration. The internal heat load generated by machinery and equipment in such places may be many times that of a normal commerical building. With evaporative cooling using large quantities of outside air, all of which is drawn through the cooling equipment and delivered at high velocities to those points where cooling is required, this internal heat problem can be overcome at a cost not much more than that of mechanical ventilation.

Laundry in Severe Test

Probably the severest hot spot is the laundry. This is a plant that not only produces heat through the processing equipment installed, but steam and water vapor as well. A look at what can be done in the laundry through installing an evaporative cooling system will illustrate what can be expected in all high temperature and high humidity environments. The main pieces of laundry equipment which subject the plant to high temperature and humidity are the flatwork ironers, presses and washers. If canopy hoods are installed over the flatwork ironers, this source of heat

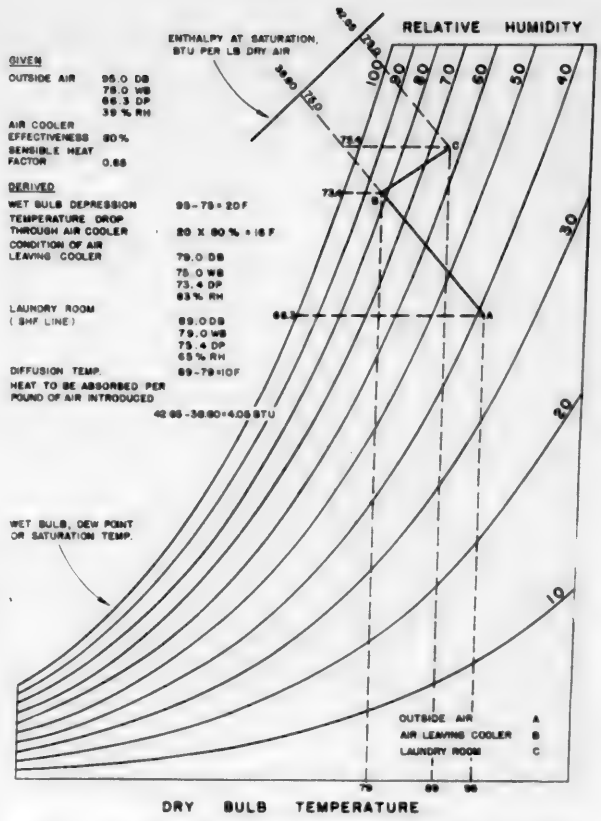

RELATIVE HUMIDITY
ENTHALPY AT SATURATION, BTU PER LB DRY AIR
GIVEN
OUTSIDE AIR 95.0 DB 78.0 WB 66.3 DP 39 % RH
AIR COOLER EFFECTIVENESS 80%
SENSIBLE HEAT FACTOR 0.65
DERIVED
WET BULB DEPRESSION 95 - 75 = 20 F
TEMPERATURE DROP THROUGH AIR COOLER 80 X 80 % = 16 F
CONDITION OF AIR LEAVING COOLER 79.0 DB 75.0 WB 73.4 DP 83 % RH
LAUNDRY ROOM (BHF LINE) 89.0 DB 79.0 WB 73.4 DP 65 % RH
DIFFUSION TEMP. 89 - 79 = 10 F
HEAT TO BE ABSORBED PER POUND OF AIR INTRODUCED
42.65 - 38.60 = 4.05 BTU
WET BULB, DEW POINT OR SATURATION TEMP.
OUTSIDE AIR A
AIR LEAVING COOLER B
LAUNDRY ROOM C
DRY BULB TEMPERATURE

Fig. 1. Psychrometric chart on which is plotted an evaporative cooling problem, characteristic of a laundry.

TABLE 2—BOILER HORSEPOWER REQUIREMENTS OF IRONERS, PRESSES AND WASHERS

Equipment	Rated BHP	Equipment	Rated BHP
IRONERS No. of Rolls and Ironer Length, Inches		WASHERS* Size in Inches	
2—Roll—100	3.10	24 x 24	0.05
2—Roll—120	3.80	24 x 36	0.05
4—Roll—100	6.30	30 x 30	0.19
4—Roll—110	6.80	30 x 36	0.21
4—Roll—120	7.60	30 x 48	0.26
6—Roll—100	9.00	36 x 36	0.27
6—Roll—110	9.90	36 x 54	0.36
6—Roll—120	10.70	36 x 64	0.40
8—Roll—100	12.80	42 x 36	0.33
8—Roll—120	14.20	42 x 54	0.43
12—Roll—120	19.00	42 x 64	0.49
PRESSES		42 x 72	0.53
Body Press	1.00	42 x 84	0.60
Bosom Press	1.50	42 x 96	0.67
Combination	1.50	44 x 36	0.35
Collar and Cuff	0.75	44 x 54	0.46
Cuff and Gusset	0.75	44 x 60	0.49
Double Collar	0.75	44 x 72	0.57
Double Sleeve	0.75	44 x 84	0.64
Double Sleeve Form	0.25	44 x 96	0.71
One Lay Double Sleeve	0.54	44 x 108	0.78
Single Collar	0.30	44 x 120	0.85
Two Lay Sleeve	0.27	54 x 84	0.82
Yoke	0.32	54 x 96	0.91
Coverall	0.75	54 x 108	1.00
Mushroom	0.37	54 x 120	1.09
Mushroom Tapered	0.47		
Apparel Rectangular	1.90		
Apparel Tapered	1.90		

NOTE: If average actual use is less than rated capacity, reduce BHP load by appropriate use factor.
* Probable heat released to laundry room.

may be ignored as the heat produced by the ironers will be exhausted by the hoods to the outside. In similar fashion, it is not necessary to include tumblers in the load calculation as these machines are vented to the outside. In determining the internal heat load that must be dissipated, about 65% of the delivered hourly boiler horsepower is sensible heat. Table 2 gives boiler horsepower requirements of typical laundry equipment. The other load component, heat leakage into the laundry, can be calculated like that of any other building.

Since the degree of cooling is limited by the prevailing wet bulb temperature, it is usually necessary to limit the diffusion temperature or the difference between the laundry room temperature and the evaporative cooling discharge temperature, to not more than 10 deg or to conditions that will not exceed 78 deg effective temperature at the work stations.

Figure 1 is a skeleton psychrometric chart on which is illustrated an evaporative cooling problem involving a heat load that is characteristic of a laundry during the summer. Figure 2 shows the conditions that would prevail if a mechanical ventilating system of the same air handling capacity were installed. Using the evaporative cooling system reduces the dry bulb temperature in the laundry from 105 degrees to 89 degrees or a temperature drop of 16 degrees beyond that for mechanical ventilation. Table 3 shows the improvement in terms of reduction in effective temperature. It is interesting to note that the air handling capacity of the evaporative cooling system for any laundry with these specified conditions can now be

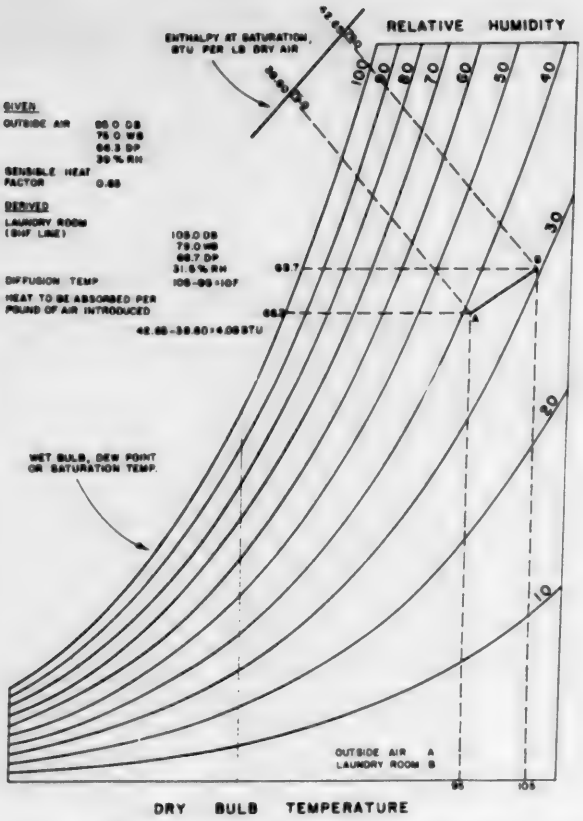


Fig. 2. Psychrometric chart to show conditions what would prevail in laundry where a mechanical ventilating system is used.

easily calculated since the enthalpy change per pound of air is a constant. Simply divide the hourly load expressed in Btu by the enthalpy change to obtain the number of pounds of air that is to be handled by the evaporative cooling system. Figure 3 gives computations for a typical laundry using these design conditions.

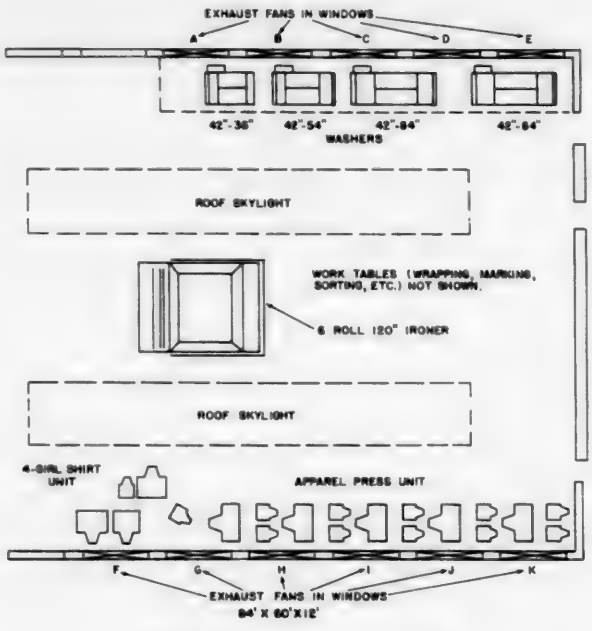
A properly designed evaporative cooling system will reduce the temperature in a laundry from 5 to 10 deg below outside temperature. With mechanical ventilation laundries usually exceed the outside temperature by at least 10 deg. Air distribution should be designed for a maximum throw of not more than 30 ft. A minimum circulated velocity of 100 to 200 fpm should prevail in the occupied area. In buildings having high ceilings or relatively few workers in a large area which would be impractical to cool, spot cooling should be considered. This may also be true of exceptionally hot areas such as pressing and ironing departments. In such cases ducts can discharge the air directly on each worker thereby cutting down on the capacity of the system required and assuring cooling at the critical places. For spot cooling there should be some means of manual control to direct the air where it is desired with at least 500 cfm, having a target velocity of 600 fpm at the work stations. Velocities higher than this are impractical as the cooling power of air increases only as the square root of the velocity. Many plants can best be cooled using a combination of area and spot cooling. Finally attention should be paid to lint. Exhaust fans must be equipped with automatic shutters so that lint will not blow back into the room when the fans stop.

TABLE 3—EFFECTIVE TEMPERATURE COMPARISON

Air Velocity, Fpm	Effective Temperature	
	Mechanical Ventilation	Evaporative Cooling
25	87.5	83.0
100	87.0	82.0
200	86.5	81.0
300	86.0	80.0
400	85.5	79.5
500	85.0	78.5
600	84.5	78.0

Roof type exhausts need lint screens or traps for their proper operation.

Evaporative cooling systems for hot spot applications will effectively provide relief from the heat thereby contributing to worker efficiency and improved employee morale. Without it, increased absenteeism, high labor turnover and increased danger to personnel health and safety can be expected during the summer months. Production declines in uncoded plants can be expected to range anywhere from 25 to 40% of normal on hot days.



LAUNDRY EQUIPMENT	BHP
1 - 42 X 36" WASHER	0.33
1 - 42 X 54" WASHER	0.43
2 - 42 X 84" WASHER	1.20
1 - 6 ROLL 120" IRONER	10.70
1 - COMBINATION PRESS	1.50
1 - BODY PRESS	1.00
1 - DOUBLE CUFF PRESS	0.75
1 - COLLAR AND CUFF PRESS	0.75
1 - YOKE PRESS	0.32
5 - APPAREL PRESSES	9.50
10 - MUSHROOM PRESSES	3.70
TOTAL DEMAND LOAD	30.18

USUAGE FACTOR 88% AT 30.18 = 26.56 AVERAGE BHP LOAD
26.56 X 33,500 = 889,760 BTU
BUILDING HEAT GAIN = 110,400 BTU
TOTAL COOLING LOAD 1,000,160 BTU

1,000,160 / 60 X 4.06 = 4115 LBS AIR PER MIN. OR 56,636 CFM*

*PROVIDES APPROXIMATELY ONE MINUTE AIR CHANGE

Fig. 3. Evaporative cooling requirements for typical laundry at standard design conditions.

Quick Recovery is Feature of

Heating for Flight Test Facility

F. J. TURNBULL
Senior Engineer, Fay, Spofford & Thorndike, Inc.,
Boston, Mass.

Special heating problems are created due to the opening of large telescoping doors of airplane hangars. Heating system described serves hangar, office and shop areas and supplies steam for snow removal system.

Large, telescoping sliding doors of the hangars at Hanscom Field. Steam lines follow the underside of the cantilever roof sections.

AIRPLANE hangars lose a large amount of heat when the large doors are opened, and to insure the proper functioning of such doors in winter, a snow removal system must be provided.

Therefore, the heating system installed in the new 1.75 million dollars test facility at Hanscom Field, Bedford, Mass., for Raytheon Manufacturing Company has a number of features of interest to a heating engineer. This system, designed to maintain a uniform temperature of 65 deg F in each of two 17,800 sq ft hangar bays against conventional heat losses, is calculated to:

1. Recover in one hour a heat loss of 800,000 Btu caused when the 180 ft long telescoping side doors are opened.
2. Provide sufficent steam to heat and ventilate the laboratory and office areas.
3. Supply heat to two large snow removal systems and a 500 gph hot water generator.

Two oil-fired, package-type, fire tube boilers, located in a boiler room adjoining the structure along the north side, and rated at 225 hp each, provide the steam necessary for the system and its auxiliaries. The units are interconnected and are equipped with pressure switches to control the line pressure. When the heating load becomes too heavy for one boiler, steam pressure drops below the operating minimum, the switch closes, and the second boiler fires automatically to meet the demand.

Condensate comes back from the hangars by a vacuum system, terminating in a receiver tank in the boiler room. Two electric driven, boiler feed pumps each rated at 50 gpm at 20 psig, feed the condensate from this receiver to the generators. A vacuum pump electrically driven, is designed to remove air at a maximum rate of 50 cfm at 10 inches of mercury. Another pump unloads the condensate from the receiver, pumping it into a sewer when the quantity of condensate return exceeds the boiler feed.

Distribution System

From the 10-inch diameter steam outlet header, two 8-inch branch mains feed each hangar and the shop and office areas. In each hangar, 6-inch diameter steam lines, welded into the supply header extend laterally to feed 8 high-capacity space heaters.

Provision for vertical movement in the steam and condensate piping in the hangar bays is necessary due to the cantilevered, suspended roof design. Wind loads created against the underside of the roof when hangar doors are opened can flex the roof structure through a maximum distance of 21 inches at the outer extremity. Therefore, swing joints are provided near the junction of each branch to the steam header.

Hangar Heating

Adequate distribution of heat at the working level in each hangar is the function of the eight projection type unit heaters. These are designed for air volume and a low temperature rise, with a capacity great enough to circulate the entire air volume in nine minutes.

Each heater is suspended from the roof purlins on support rods and structural channels. Each delivers 340,000 Btu per hour, discharged radially by means of an electrically driven fan integral with the unit. Float and thermostatic type traps are installed on the space heaters and at the end of each steam line to dump condensate into the return piping.

Two oil-fired packaged boilers are interconnected so that one unit cuts in to handle peak heating loads.

Bronze and bronze-mounted, iron body shut-off valves are specified throughout the system: At the boiler on the outlet connections, on the main steam headers, and at each unit heater. Any heater can be isolated from the rest of the system with no adverse effects.

Thermostatic controls are mounted on each of the walls dividing the hangars from the central shop and office area, oriented so that two unit heaters in a bay are controlled automatically from one instrument.

Snow Removal Equipment

A snow removal system is designed to insure mobility of hangar doors regardless of weather conditions. In the boiler room, a heat exchanger is supplied with steam from the boilers to heat a 40% glycol solution circulating in pipe coils within the vessel. Up to 1200 pounds of steam per hour enter the top of the heat exchanger shell through a four-inch inlet, flows around the tube nest, and after condensing returns to the condensate receiver through a trapped return line.

Steam flow to the heat exchanger is regulated by a temperature controller in the glycol solution supply. This mechanism operates a regulating valve on the steam inlet line, thus controlling the glycol solution temperature. Its setting corresponds to a supply temperature of 158 deg.

Two pumps, rated at 60 gpm against a 90 ft head, circulated the glycol solution through the heat exchanger into the snow removal piping. These are energized by a manual switch and are designed to operate continuously during periods of inclement weather.

Beyond the boiler room, two 2-inch diameter, wrought iron distribution mains, branching easterly and westerly, subdivided the snow melting into two systems. The radiant panels averaging nearly 6 ft wide, extend the full length of the door, travel along the east, south and west walls, a total area of about 3800 sq ft.

The radiant heat emission is calculated as 230 Btu per square foor of exposed panel surface plus an allowance of 30% for downward and edge losses.

Six grids in each of the two systems are laid in the concrete slab under the door tracks and are covered with a 6-inch thick layer of concrete. This depth corresponds to the depth of the door tracks.

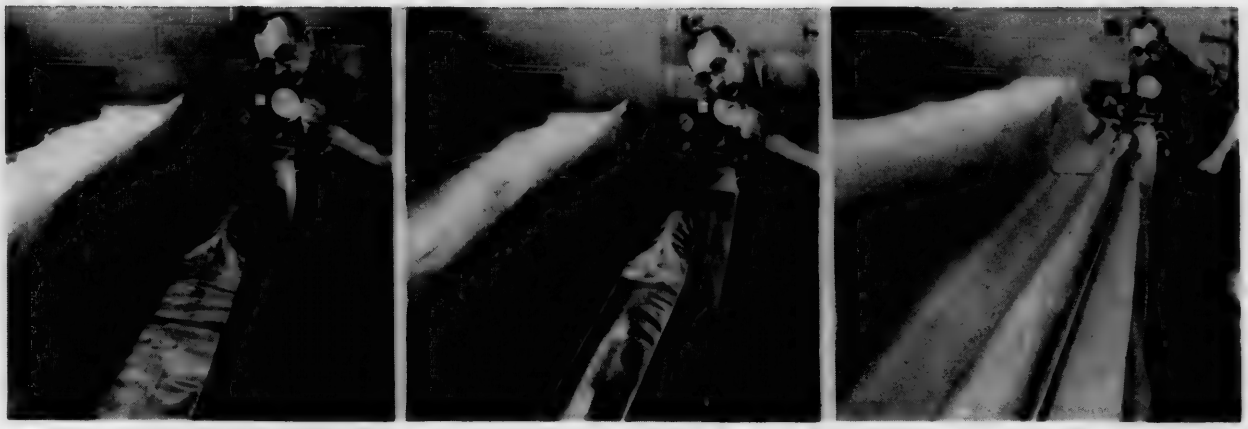
Each grid consists of two, 1½-inch diameter headers positioned in a horizontal plane and interconnected by multiple one-inch diameter pipes laid six inches on centers. The headers are connected at opposite ends so that glycol solution entering one header must circulate in equal proportions through the piping before it can be discharged from the second header.

Each grid assembly has an individual return line that is fitted with an accessible hand-operated regulating valve and a thermometer. When the system is started, an operator adjusts the flow of the returning solution to obtain the proper temperature in the pipe grid. When all thermometers read the same, the system is in balance.

When the hangar doors are closed, two-thirds of the radiant panels in the system actually are inside of the hangar. Provided the system is operated continuously, the heat from this source becomes an effective barrier against drafts infiltrating around the doors.

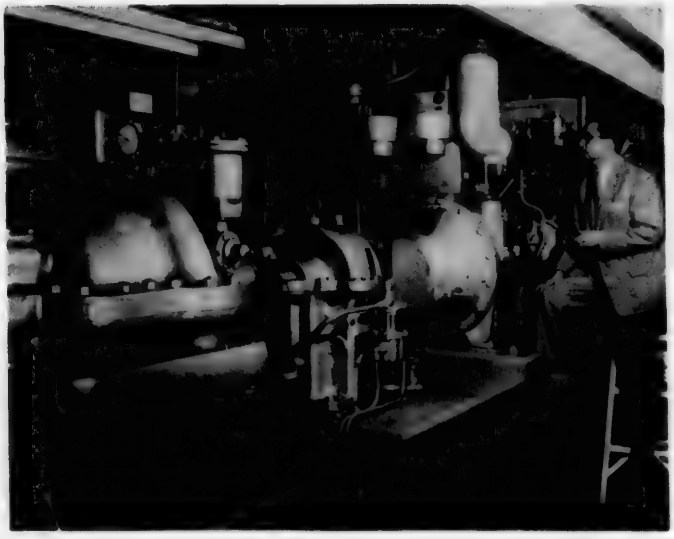
TABLE I—DESIGN DATA FOR HEATING SYSTEM

Calculated heat loss per hangar	Btu/hr
Through roof	210,000
Through closed doors	413,000
Through north wall	114,000
Through south wall	124,000
Through floor	95,000
Through normal operation of hangar sliding doors (recovery factor)	800,000
Normal infiltration	800,000
Total heat load in structure	
Hangar areas	5,112,000
Shop area	
Heat	1,093,000
Ventilation	2,935,000
Snow removal systems	1,200,000

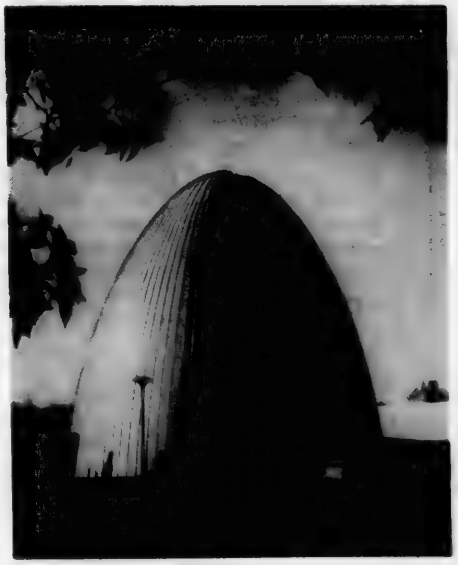


▲ INFLATABLE TUBING. Experimental production of light-wall seamless metal tubing that can be shipped in ribbon form and inflated at the point of use is announced by Wolverine Tube Div., Calumet & Hecla, Inc., Allen Park, Mich. The material, to be known as Strubing (strip tubing), is seen to offer two major advantages. First, point-of-use inflatability, shown in sequence above, permits economical shipping of thin-wall tubing; second, the process used in its manufacture provides an economical means of producing thin-wall tubing in materials and thicknesses either unavailable today or available only at prohibitive cost.

Picture Paragraphs



◄ PISTON ENGINE DRIVE. A unique water chilling machine, powered by natural gas, has gone into operation to air condition the display areas of Milwaukee Gas Light Co.'s main office building. Replacing the customary electric motor or steam turbine power source, this 150-ton Carrier centrifugal cooling unit is driven by a Waukesha piston engine using natural gas as fuel. Installed to dramatize gas as an energy source, it operates at a cost which compares favorably with other types of systems.



► RESEARCH REACTOR. The world's largest nuclear research reactor entirely owned and operated by private industry is in operation at Plainsboro, N. J. Facility is the 5000-kw research reactor of Industrial Reactor Laboratories, Inc., owned by 10 of the nation's leading industrial companies. A "swimming pool" type of reactor, it was erected by the companies to provide them with an important new tool for basic and applied research in their respective fields. The IRL participants are American Machine & Foundry Co., American Tobacco Co., Atlas Powder Co., Continental Can Co., Corning Glass Works, National Distillers & Chemical Corp., National Lead Co., Radio Corporation of America, Socony Mobil Oil Co., and U.S. Rubber Co.

Minimum Design Standards for

Radiation Fallout Shelters

ROBERT B. PANERO
Special Projects Staff
Guy B. Panero Engineers, New York, N. Y.

The February, 1959, leading article dealt with the selection of services for underground shelters. These shelters were designed to provide blast protection, as well as fallout protection, for targets of an enemy nuclear attack.

Just what constitutes target area is indeterminate; target area depends on time period, enemy capability, and strategy. It could conceivably represent deliberate radiation fallout over a large portion of the United States.

The Special Projects Staff of Guy B. Panero Engineers has developed a series of shelters, designed to protect against fallout, yet sparing the expense of full blast protection. A report on these shelters, prepared for the Office of Civil and Defense Mobilization, Battle Creek, Mich., is summarized on the following pages. The contents do not necessarily reflect OCDM policy on this subject.

A PURELY Twentieth Century phenomenon, the radiation fallout shelter is an extremely complex problem, not only from the mechanical point of view but also from the architectural and humanitarian aspects.

A voluminous report on the subject, prepared by the Special Projects Staff of Guy B. Panero Engineers, was designed to establish general guide standards, modular plans, and specifications for various sized radiation fallout shelters *if required as new construction.* As the study progressed, it became evident that it would be impossible to develop a set of standards which would include all of the many variables encountered. The approach, then, has been to work toward minimum conditions in terms of space allocations and installed equipment. Local variations are, of course, possible; the report merely represents an attempt to produce minimum designs adaptable to a broad range of installations.

Based upon the modular arrangement of the sleeping quarters and using a three-tiered bunk arrangement, nominal shelter populations have been assumed in varia-

tions of 24, 144, 432, 1728, and 5184 persons, with maximum, "crowded" populations of 32, 208, 572, 2508, and 7184 persons, respectively. Although a future capability of blast protection would be inherent in these shelters, their primary function is the protection of the civilian population from the radioactive fallout effects of a major thermonuclear attack on the United States. All other functions, such as alternate uses of the shelters during peacetime, must remain subordinate.

Living and Sleeping Considerations

As shown in Fig. 1, the architectural plan for 144-person shelter design, the recommended occupancy is based on a compartment 41′-8″ long by 15′-2″ wide, inside dimensions. A center aisle, 3′-0″ wide, would split the longer dimension. On either side of this center aisle would be four rows of bunks, each row consisting of three triple-deck bunk units. The basic compartments, then, would contain 72 bunks and would be lined up as modules in multiples as required by designed shelter occupancy. With the "hot bed" method of shift sleeping, creating a 12 hours up and 12 hours down pattern of life, each compartment would provide sleeping facilities for 144 occupants.

Feeding

Feeding the shelter population would probably have to be done on a shift basis, with the operation organized on a continuous 24-hour system. The feeding operation would follow the "hot-bed" shift arrangement, with each shift receiving three meals a day.

Food would be stored in a centrally located storage area and would probably consist of a military canned-ration type food allotment. Based on this type of ration, a minimum of 3 cu ft of storage space per person would be required for a 14-day occupancy period.

Plumbing Considerations

Plumbing considerations that have a serious cost and liveability impact include:

1. Water supply, storage and distribution
2. Sanitary facilities
3. Personal hygiene facilities
4. Sewage disposal

1. The problem of water supply and storage is an extremely variable one, heavily dependent upon geographic locality. It has been recommended that a minimum of 10 gallons per occupant per day be provided, and that this quantity should provide for two flushings of standard water closets per occupant per day at 3 gallons per flushing, and 4 gallons for drinking, food preparation and minimum personal and general hygiene when 14-day occupany is necessary. Where adequate and proven well water sources exist, it would not be necessary to store water, but if the primary source should be a municipal distribution system or other source, storage facilities should be provided at the previously mentioned 10 gallons per occupant per day rate.

A hypothetical case should be drawn here. If a shelter were so located that the municipal or public water system had a degree of protection compatible with the degree of protection afforded the shelter, water storage would not increase the survival capabilities of the shelter. If, however, the shelter could survive destruction of the municipal water system, then it would have to have an independent water source, protected to a degree compatible with that of the shelter itself. Because on-grade construction would be cheapest, such water storage facilities could be located on grade if the shelters were designed strictly for radiation fallout effects and no additional "blast-hardening," other than that inherent in the structure, were provided. In any case the protection of the water supply would have to be compatible with the degree of protection built into the shelters. They would, however, have to be protected against malicious mischief during peacetime and possible willful damage during an emergency period. Minimum protection should consist of at least a chain-link fence surrounding the entire shelter installation.

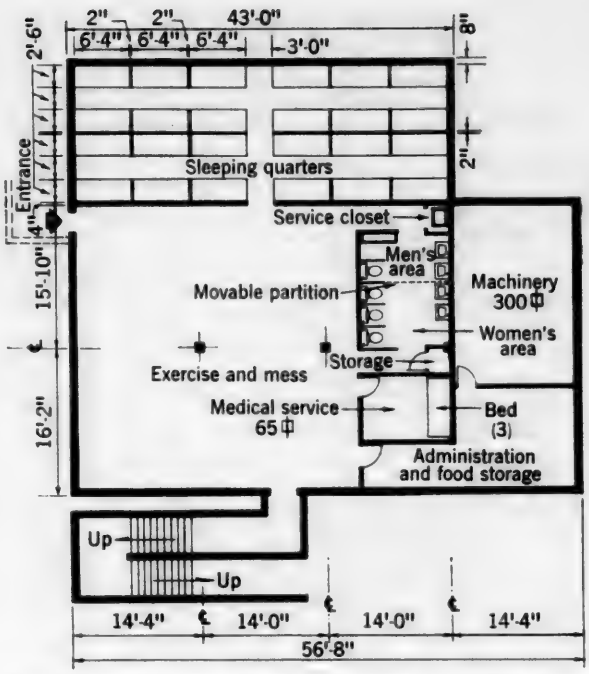


Fig. 1. Architectural plan for 144-person radiation fallout shelter design.

Water distribution might be accomplished by hydropneumatic tank units in all shelters. Such a unit would consist of a hydro-pneumatic tank, a centrifugal pump or vertical well pump, an air compressor and necessary control devices. Water distribution points should be limited to, say, the toilet rooms, for supplying the plumbing fixtures; the mechanical room, for boiler make-up; and possibly the medical area. Such limited distribution would eliminate the need for personnel control at any but those points. An installed drinking water system, for example, would only amplify the problem of water conservation and personnel control. Drinking water might well be distributed from bottle-type dispensers, the bottles being filled from the lavatory taps.

2. In some of the smaller shelters, chemical or chemical-type toilets with low water requirements could be used, but for the larger shelters (above 144 occupants) the standard water closet appears preferable. There is no sharp dividing line below which chemical toilets should be used and above which water-borne sanitary systems should be used. It is, rather, a problem directly related to geographic locality and the availability of

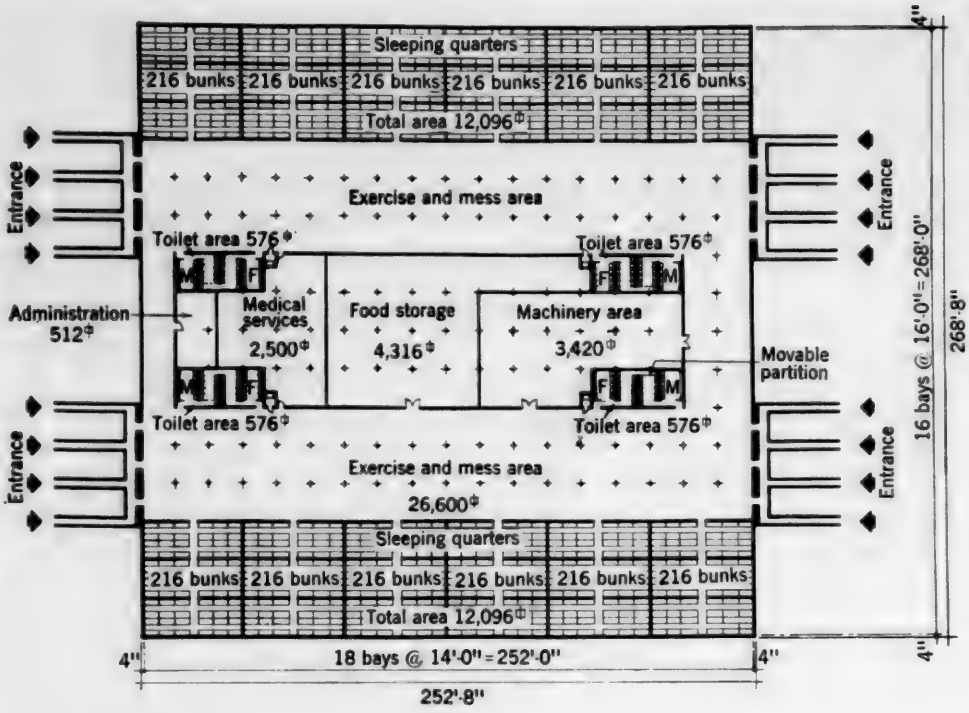


Fig. 2. Architectural plan for 5184-person shelter, illustrated in drawing at the heading of this article.

water. Though the use of chemical toilets may seem, at first, to represent considerable economy, it must be remembered that their use might very easily impose serious restrictions upon the peacetime uses of the shelter structure, create personnel problems during the emergency occupancy of the shelters, and require the additional expense of chemical agents and additional storage facilities. For a wide range of possible installations, the standard water closet could be used more effectively using reduced numbers of fixtures per person than chemical-type toilets.

3. Personal hygiene facilities should be limited to only lavatories because of the severely critical water storage requirements, and the "minimum" nature of the shelters. Showers could be provided for personnel decontamination, but based upon original assumptions which established the criteria (a certain population, area remote from blast effects, and adequate warning before fallout effects become measurable) the need for decontamination showers is questionable. For minimum provision, hot water is not a necessity and personal hygiene should be limited to only meal-time washing. People can, of course, survive fourteen days without washing.

4. The problem of sewage disposal is an important one. The ideal system is one which immediately conducts all sewage out of the shelter space. No matter what type of sanitary fixture is used, internal storage of sewage should if possible be avoided. With some fixture types this is almost impossible. Preferred systems consist of sub-floor piping systems which collect waste and soil from sanitary fixtures and personal hygiene fixtures, sewage ejector pump units and piping to the outside. The discharge piping from the sewage ejectors could conduct the sewage to any of three disposal points: (a) municipal sewers (b) septic tanks and tile fields; and (c) local streams or suitable on-grade locations. In all cases alternate disposal facilities should also be provided.

Medical Considerations

The basic assumption that the shelters would be used for fallout protection only results in establishing that injuries resulting from blast effect would not be anticipated. The medical problem, then, would consist of providing only for the routine medical needs of the shelter populations as aggravated by anxiety and stress due to the catastrophe. Because of the "minimum" nature of the shelters, and also because of the fact that the national ratio of doctors per capita is approximately 1:800, the medical provisions for the smaller shelters (up to and including the 432-occupant shelter) would possibly consist of no more than a well-stocked first aid kit. In the two larger sizes (1728 and 5184 occupants), a regular hospital infirmary capability should be included. Such infirmaries could provide for all of the normal medical needs of the shelter, with a minimum storage space of 80 cubic feet per 1000 occupants for medical supplies; a room capable of being used for deliveries and emergency surgery; and other rooms for confinement of persons suffering from severe shock or other emotional disturbances requiring isolation and confinement.

Infirmary bed space could be provided for approximately 1.6% of the shelter population. Thus, for the 1728-occupant shelter, 32 beds would be required and for the 5184-occupant shelter, 84 beds should be included. The bed areas should be planned so as to facilitate separation into "wards" according to disease, age or sex. These beds would be in addition to the ones required in the sleeping quarters and could be used as additional normal sleeping space during an overcrowded emergency if medical consideration did not require the additional space.

Environmental Control

One of the most important considerations, and the one

which perhaps would have the greatest effect upon the occupants living in the shelter, would be that of environmental control. This involves the heating, ventilating and air conditioning systems. The criteria for these systems should be:

Maximum additional protection for minimum costs
Minimum-sized openings to the exterior
Minimum equipment to perform maximum functions
Simple control and maintenance
Austere conditions

In order to develop a design which adheres to these criteria, many items require study. Based on evaluations of the many environmental factors, the following conclusions were drawn:

1. *Outdoor air requirements.* Various studies have indicated that 1 cfm of outdoor air provides the oxygen required by the human body when light work is performed. That quantity of outdoor air intake would not meet the requirements of a ventilating system for diluting the CO_2 content in a crowded shelter atmosphere. The CO_2 content should not be allowed to reach concentrations above 0.6%. In order to limit the CO_2 to that level, a minimum of 4 cfm outdoor air intake per person would be required, and that figure is the minimum which should be considered for long term occupancy. Short term occupancy may well be satisfied by calculating and/or designing for infiltration sufficient to allow liveability over specified time periods.

2. *Indoor environment requirements.* Effective Temperature is an arbitrary index developed to indicate the effects of temperature, air movement and humidity upon the human body. The Panero report recommends a conservative indoor condition of 74 ET. Though this may seem to be a somewhat low figure, it would minimize the problem of reheating to control dewpoint conditions, and it would permit possible over-population of the shelter.

3. *Emergency ventilation.* An emergency means of ventilation should be made available for the smaller shelter (24 occupants). Such emergency ventilation might be accomplished by hand-operated blowers. It is not considered necessary to provide emergency ventilation for larger shelters because the shelter spaces would have a holding capacity of approximately 3½ hours before the CO_2 concentrations would become critical. In this period of time repairs are possible.

4. *Refrigeration requirements.* There are many methods of cooling air, and the method which would best suit the needs of an individual shelter would be in large part determined by local conditions. Thus, it might be possible to utilize well water in certain areas for pre-cooling, or 100% cooling. However, such variables cannot be anticipated in a standard design. The report recommends a reciprocating refrigeration unit and an air-cooled (exposed) condensing unit, with local variations where possible. It must be remembered that refrigeration requirements depend on the anticipated population one wishes to accommodate; possible serious overcrowding above the anticipated shelter population; period of occupancy; and local climatic conditions. Therefore the mechanical refrigeration equipment might be "minimal," even critical, during two months of the year, but much more than adequate during the other ten months, because of local climatic conditions. Combinations of the above outlined variable are extraordinarily numerous. The resolution of such design problems would have to be on the basis of local option.

5. *Heating requirements.* For the smaller shelters (24 and 144 occupants) where heating would be required electric heating is recommended. For the larger shelters, however, hot-water heating might be employed because of its reliability, economy and simple maintenance. Heating of the larger shelters could be accomplished by means of a heating coil in the air handling system.

6. *Outdoor air filtering requirements.* According to previous studies, fallout particles would be approximately 10 microns in size. Though standard, disposable-type air filters would remove such particles, they are by necessity loose-fitting. Thus, leakage around these filters is inescapable. A higher degree of filtration could be accomplished by using a disposable-type filter for rough filtering, and a tight-fitting high-efficiency filter for fine filtering. Both filters would be installed on grade in a concrete filter house. Additional benefits might result with this system for additional protection against bacteriological and chemical weapons.

7. *Deodorization of shelter atmosphere.* Deodoriza-

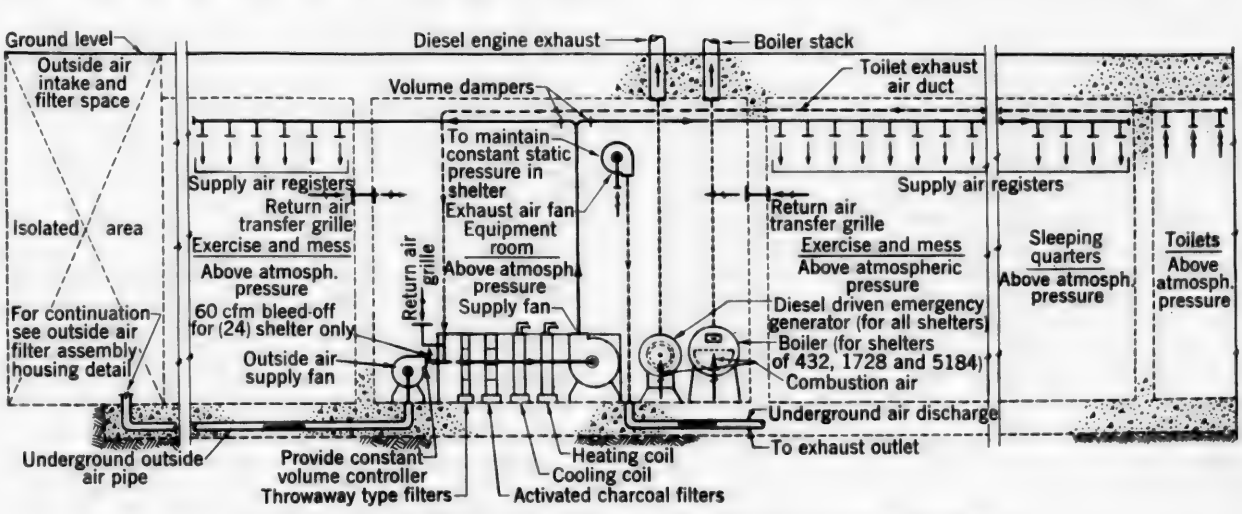


Fig. 3. Schematic diagram of typical air handling system for fallout shelter.

tion of the recirculated air of the shelter atmosphere would be desirable because of the low (4 cfm) amount of outdoor air intake. For such de-odorization, the use of activated charcoal filters on a local option basis is recommended because of their reliability, their wide range of absorbing characteristics, and their availability.

8. *Air handling and distribution.* A low-pressure, low-velocity ceiling supply system, without return ductwork (except from toilet areas), suits the requirements of the shelters. Air would be supplied through perforated metal pan type or rectangular type diffusers, and returned by circulation through transfer ducts and grilles. A schematic diagram of a typical air handling system is shown in Fig. 3 on the preceding page.

9. *Oxygen generation and CO_2 absorption equipment.* Because oxygen and CO_2 concentrations are controlled by adequate supply and recirculation of air, no oxygen generating or CO_2 absorbing equipment should be required. Previous studies have indicated that such systems are expensive and should be used only when complete independence from the surface is an established requirement.

10. *Control of indoor air pressure.* A constant volume controller is necessary to insure the steady supply of fresh air, as filters may become partially blocked and slight changes may occur between outdoor and indoor atmospheric pressures. The exhaust system should be designed to maintain a constant positive static pressure inside the shelter. This would minimize leakage of radioactive particles and/or chemical and bacteriological agents into the shelter through doors or other openings.

Electrical System Requirements

The electrical system should provide adequate power and lighting to carry on all functions. The system described in this report is a minimum considered adequate to provide for:

1. Utilization of municipal power sources during peacetime
2. Generation of power within the shelter during the emergency occupancy period
3. Adequate lighting to carry on all necessary emergency period functions
4. Emergency lighting

Based upon studies of the above items, the electrical system should provide:

1. *Utilization of municipal power sources during peacetime.* For uniformity in design, the 120/208-volt, 3-phase, 4-wire service has been selected because it is thought that such service is the most representative on a nationwide basis. Peacetime metering of the electrical service should be done outside the shelter. Consideration should be given to each individual shelter, since there would be local variations as to the type of service, and since, for the larger shelters, items of considerable cost might be involved depending on the economy and desires of the local area served. It has been assumed that local utility sources could handle up to 20-hp across-the-line starting.

2. *Emergency generation of power.* It is probable that local utility plants would not be in operation during the fallout period. They might in themselves constitute secondary targets. It might therefore be necessary to provide an emergency means of generating electrical power during the emergency. Although several types of generator prime movers are available, the report recommends that all emergency generators be diesel driven. In the smaller shelters, gasoline units might be used, since they are less expensive intially than diesel units. The use of gasoline units, however, would introduce possible fire hazards and would result in storage of a more volatile fuel than diesel.

Fuel oil could be stored outside in buried tanks which would be sized to hold approximately three weeks' continuous supply. The additional week's supply would permit periodic testing of the emergency generators. All generators should be sized to carry near-full load, and, in the larger shelters, should consist of multiple sets of small units in order to permit partial service during any required repairs. Starting should be accomplished through manually-operated hydraulic starting devices. Cooling of the generator prime movers should be accomplished through the use of a remotely located (outside) air-cooled radiator.

3. *Lighting requirements.* The most economical and most reliable type of lighting for continuous operation is incandescent lighting. Its use also simplifies maintenance and reduces space required for storage of bulbs. Quick restoration of service after voltage dips is easily accomplished.

Lighting intensities in the sleeping areas should be kept low—2 to 3 footcandles—and in other areas the intensities could vary from 10 to 25 footcandles. The use of special directional lamp shades is recommended in sleeping areas. Lighting fixtures in other areas should be standard porcelain outlets or steel dome reflector fixtures.

Switching should be held to a minimum, and located so as to minimize the chance of tampering.

Lighting panels and power panels should be 3-phase, 4-wire types. Power panels should incorporate circuit breakers for purposes of safety, ease of operation, and quick restoration of service after possible failures.

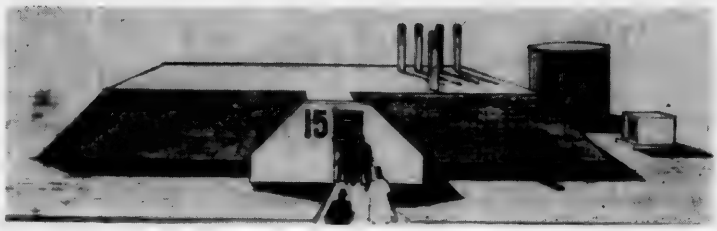
4. *Emergency lighting.* An emergency lighting source should be provided in all of the shelters. Such emergency lighting might consist of battery-operated trickle-charged lamp units.

Radiation Protection

Because of the uncertainty and controversy to which both the emission characteristics of fallout radiation and the maximum permissible body dosages are subjected, it is necessary that as high a measure of protection as practicable be established. In order to establish such protection, it is necessary to study:

1. *Shelter requirements.* The National Fallout Shelter Policy has established shelter types with radiation attenuation factors from one (1) through and including factors in excess of one thousand (1000). Permanent structures designed especially as personnel shelters have been considered to be in the plus-1000 attenuation factor category.

2. *Shielding requirements.* The attenuation afforded is directly related to the mass thickness of the shielding material. The cheapest shielding material is earth fill. Therefore, if earth cover were utilized as a shield, it would be necessary only to provide a structural slab capable of supporting itself, the earth fill, and normal live loads. Since the greater part of the cost of the shield would be the cost of the structural slab, large increases in attenua-



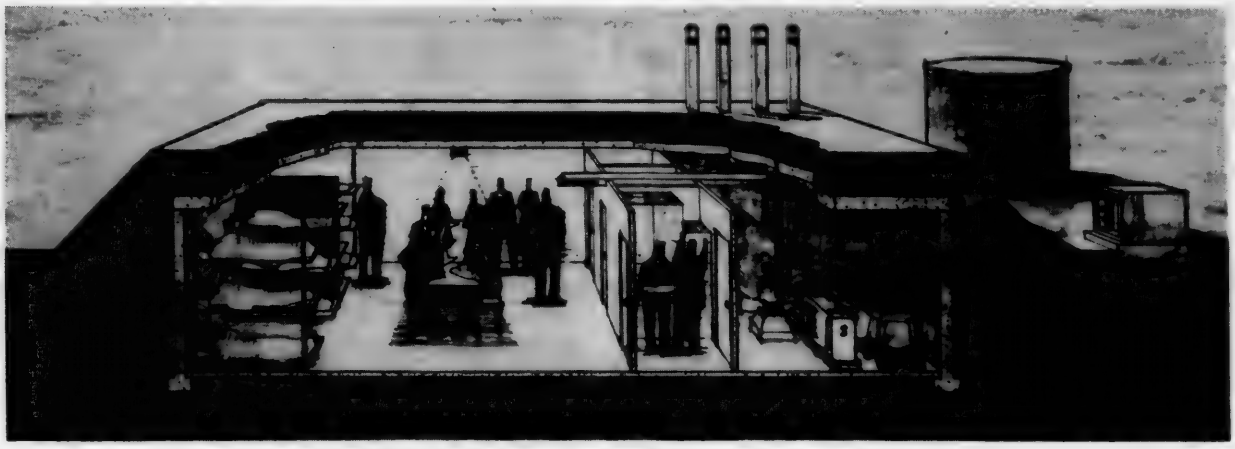


Fig. 4. Exterior view (at right) and perspective section (below) of 24-person radiation fallout shelter. Section exposes, from left to right, sleeping, exercise and mess, storage, and machinery areas.

tion would be possible at relatively slight increases in cost. The design discussed here, therefore, is based upon an attenuation factor of 5000.

3. *Structural considerations.* In order to satisfy the functional requirements of the shelter, it was found that a structure, rectangular in plan, with a flat slab roof, permitted the best utilization and greater flexibility. Because the roof slab would be required to support only itself, the earth fill and normal live loads, it could be relatively thin. The earth fill performs the function of shielding. The minimum slab thickness recommended is 7 inches. The structures might be constructed on-grade, semi-buried, or buried, but in all instances would have a minimum of 2 feet of earth cover or fill.

Conclusion

This discussion thus far has dealt with relatively large shelters that would probably require municipal guidance and funds for their conception and construction. Until such adequate protection is available it is expeditious for people to review with foresight the existing structures available that may be suitably used or modified to serve as improvised shelters.

A great number of families have basements in their houses. An increasing amount of publication and interest in the problem of survival is making people aware that their own homes offer excellent possibilities for radiation protection. Documents are available (Office of Civil and Defense Mobilization) which tell the homeowner in simple terms what is required to convert and stock an area of the basement for use as a radiation fallout shelter. The homeowner is left to his own monetary capabilities for embellishments beyond the minimum necessities. In the same category as basements are storm cellars and, to a much more limited degree, natural caves.

In large cities where real estate values make it extremely difficult to allocate space for shelter construction, modern architectural trends have inherently provided shelter areas in the central core spaces used for corridors, stairs, toilet and elevator services. Though it would be unlikely that continuous water services would be available, the pipes within the central core would be filled and might well satisfy the necessary requirements if rationed correctly. Toilet areas would at least offer the possibility of waste disposal. The elevator shaft would probably replenish enough air with its stack effect. Good radiation attenuation would be inherent in the concrete floor construction. The effect of radiation fallout on the roof would be attenuated for the lower floors by the successive layers of concrete. Successful deployment of people from the upper levels to the lower levels and/or basement would provide quite adequate protection. The shelter structures in many areas, therefore, *exist now*. All that would be required for conversion into fallout shelters would be supplies, battery operated radios, trickle or hand generated lights, etc., in a convenient closet, and a well conceived plan, to be put in operation *now*, to fully acquaint people with the dangers of radioactive fallout, what is required for survival and what they now possess in the way of passive countermeasures.

In conclusion, it should be reiterated that more than adequate shelter can be provided by most existing structures. Fallout protection is statistical protection and an attenuation factor of 100 may well be sufficient. The only point we might make is that in any conceivable thermonuclear attack, shelters will probably be necessary from the inevitable effects of radiation over most of the nation. Such shelters may be necessary for four hours, one day, three days or fourteen days, depending upon when such an attack were to take place. Many means are available to individuals, municipalities, states and regions. Plans can be made. They can be realistic and effective. The alternative of no plans and no shelters is reckless and, in a certain sense, the height of over-optimism. We must face up to these problems for they are the problems we may be living with for the next decade or more.

The Status of Spreader Stokers

IN the last 20 years, according to Bituminous Coal Institute, the spreader stoker has become a leader in coal-burning equipment. Properly applied and operated, it is hard to beat. In earlier times it was not unusual to install the spreader over the stationary or nonmoving grates that had been used for hand firing. Some specially designed nonmoving grates are still used in small boilers, as well as shaking, dumping and continuous ash discharge grates. Larger stokers are usually equipped with the last mentioned type because it entails less labor and disturbance of the fuel bed. The first type of continuous ash discharge grate was simply a rotating chain grate that was run to either the rear or the front of the furnace, according to design demands. A later development is the flat grate that may be shaken, vibrated, or agitated so that ash is moved continuously.

Advantages

Spreader stoker manufacturers point to the following product advantages: (1) Units, particularly in the larger sizes, are lower in cost than other types. (2) They respond rapidly to changes in load demand because of some suspension burning and the thin fuel bed. (3) Grade and characteristics of coal are not as critical as on some other stoker types. Strongly caking, high ash, and low fusion temperature coals may be burned successfully because of the spreader firing method.

Limiting Factors

The following are some considerations that BCI recommends be kept in mind in the installation of spreaders:

Fire Cleaning. Single spreader stoker units, usually installed with "dump" grates on small furnaces, pose difficulties in cleaning fires. The spreader must be shut off while the grate is dumped; consequently, when the furnace is brought back on the line, "brush firing" causes a smoky condition. Frequently, because coal firing stops during the cleaning period, there is a lag in maintaining or bringing steam back to the proper pressure. The solution is the installation of multiple units so that one section of the stoker can be cleaned while the other maintains normal coal feed.

Coal Sizing. Although the spreader stoker widens the range of usable coals, size consist appears to be critical. Many major spreader stoker manufacturers recommend a ¾ inch by 0 size for optimum performance. It has been found, however, that the stoker may take coals of 1¼ inch by 0 or even 1½ inch by 0. These latter sizes are more readily available from most producing areas.

Flyash and Smoke. Some flyash or particle carryover to the stack can be expected whenever coal is burned in suspension. Smoke may also occur in spreader stoker firing unless good turbulence is established immediately over the fuel bed, particularly during low-load firing. The thin fuel bed, together with the sudden release of volatiles from the particles in the furnace space, is likely to cause smoke if proper mixing of air and gases is not provided. Overfire air is a *must* in spreader stoker firing, but even that does not always suffice at very low loads.

Load Range. Spreader stoker design requires careful consideration of the unit's limitations in handling reasonably low loads without smoke. Older spreader stokers of the continuous ash discharge type installed before 1948 could generally handle a load range of not more than 4 to 1; that is, a unit designed for a maximum continuous rating of 100,000 lb of steam per hr could be expected to operate without smoke nuisance at a minimum of 25,000 lb of steam per hr. Unfortunately, many of the pre-1948 units have had to handle excessive load ranges with the nuisance of smoke and, in some cases, of flyash. For the dump-grate type of spreader stoker, the range must generally be scaled down to about a 3 to 1 ratio. It is not uncommon now to find 6 to 1 ratios and, in some specially engineered jobs, even 10 to 1.

Air Pollution Answers

As a result of nuisance created by older spreader stoker installations that were pushed beyond a reasonable load range, BCI states, many metropolitan areas, cities and other populated centers have placed restrictions on their installation, with pollution control officials and sometimes citizens' groups branding them with a built-in nuisance value. A good modern spreader stoker can do its job without being a municipal menace. Among the means to that end are:

Overfire Air Jets. To eliminate smoke caused by lack of turbulence, overfire air jets or other means of inducing turbulence must be established immediately above the fuel bed (18 to 24 inches) so the rich, volatile gases and air are mixed thoroughly in the high-temperature zone. For ultimate satisfaction from spreader stoker operation, turbulence is most important; an excessive volume of overfire air, however, can be detrimental at low loads. Overfire air should be designed for minimum volume of air with high static pressure.

Flyash Collector. In anticipation of possible flyash problems, provision should be made in the design of the spreader stoker installation for the addition of a flyash collector. In most metropolitan areas, the collector is a requisite at the start and should be figured as part of the total equipment cost.

Flyash Reinjection. In most instances, spreader stoker manufacturers have recommended the return of flyash to the furnace for refiring the high carbon content particles. Efficiency boosts of 2 to 3% have been claimed on the basis of returning the total combustible matter in the collected solids. On the other hand, recirculating flyash has been found to overload flyash collectors, reducing their efficiency and causing particles to be emitted to the atmosphere. A sensible, generally accepted compromise is to reinject the larger particles accumulated at a point before the collector to the grate, and dump all the material from the collector to the ashpit, thus reducing carbon loss without decreasing collector efficiency.

Design and Cost Data for Ice Rinks

M. J. WILLIAMS
Application Engineer, The Trane Company, La Crosse, Wis.

Interest in ice skating is sharply increasing. Increased interest in this sport is coupled to the use of mechanical refrigeration as applied to outdoor as well as indoor rinks. Not only does mechanical refrigeration insure uniformity of the ice texture, but it also prolongs the season, especially as applied to outdoor ice skating rinks.

Many country clubs throughout the country are installing mechanically refrigerated ice skating rinks to provide an interest for their members during the late fall, winter, and early spring months when the weather is not suitable to golf or tennis. This also provides for a sport in which the entire family of club members may partake. The uniform texture of ice surfaces provided by mechanical refrigeration is especially important to the game of curling.

AIR CONDITIONING, HEATING AND VENTILATING, OCTOBER, 1959

The La Crosse Curling Club rink at La Crosse, Wis.

Design and Cost Data for Ice Rinks

M. J. WILLIAMS
Application Engineer, The Trane Company, LaCrosse, Wis.

ICE skating rinks are generally sized according to probable usage. A general rule to follow in determining size of the rink is to allow about 30 sq ft of ice surface per person. Although sizes of hockey rinks vary, the standard size of a hockey rink is 85 feet wide by 185 feet long. Curling rinks are made up of one or more of what is called "sheets" of ice, depending upon the requirements of the club membership. Each "sheet" is 14 feet wide by 146 feet long.

Rink Floors

Generally, there are four type of rink floors:

1. Open or sand-filled type (Fig. 4)
2. Permanent general purpose type with grid piping imbedded in concrete (Fig. 5)
3. All purpose type with piping imbedded in concrete with floor slab insulated (Fig. 6)
4. All purpose floors suspended on piers or walls (Fig. 7)

An open or sand-filled type floor is the least expensive type of rink floor. Grid piping rests on wood sleepers (creosoted to prevent rotting) laid on a bed of sand or crushed stone. Clean washed sand is then filled in around the grid piping (clay or cinders should never be used for the bed or fill around the grid piping.) This type of floor is commonly used for curling rinks, hockey and skating rinks, but is not intended for general purpose usage such as dancing, basketball, etc.

When the owner desires to obtain a better return on his investment, a permanent general purpose type floor should be installed. The skating area then may be used for other activities such as basketball, roller skating, dancing, boxing shows, and other events. If the area is to be employed for various activities, a terrazzo finish is commonly used.

Large city arenas and coliseums generally have an all-purpose type floor with insulation installed beneath the concrete slab. Inasmuch as floor areas in this type of building may be used for various types of activities, relatively fast freezing of the ice may be required. For this reason, the refrigeration equipment should be sized for 10 to 12 hours freezing time or pull-down time. It may be necessary to reduce this pull-down time to 7 to 9 hours, depending upon the schedule of activities.

Several types of floors for ice skating rinks have been patented. Some of these have proven to be successful, while others have not. Patented type floors are more expensive to install, and in many cases the installation costs overshadow the advantages gained. Possibly the

most popular of the patented floors is the Carpenter floor, shown by Fig. 8. This floor is built up in the following manner: A rough concrete slab is poured on a leveled ground or gravel fill. On top of the rough slab is installed a layer of rigid insulation. Over this insulation is placed unsaturated asbestos paper which is dusted with a soapstone powder. On top of the asbestos paper, a No. 5 sheet zinc (.010 inch thick, 0.37 lb per sq ft) is laid with staggered joints, lapped one inch and soldered. On the zinc sheet T-bar grid piping supports are installed on 6 to 8 inch centers the length of the rink. The grid piping is then set on the supporters and welded. Then $\frac{3}{8}$ inch reinforcing rods are wired to the bottoms of the grid pipes spaced 6 inches on center toward the ends of the rink. Toward and at the center of the rink, $\frac{1}{2}$ inch reinforcing rods are installed, spaced 8 inches on center. Next, the monolithic concrete floor is poured with the top of slab being not more than 2 inches above the center of the grid piping. When the slab covering the grid piping is poured, it should be well puddled or tamped to insure a tight bond of the concrete with the surface of the grid piping.

Jack Williams, a graduate of Kansas City Junior College, worked with Walter E. Gilham, Kansas City consulting engineer from 1923 to 1933. In 1934 he joined the Corps of Engineers, Missouri River Division, and was engaged in the design of mechanical equipment for the Fort Peck (Montana) Dam townsite buildings. Later he became shift engineer in charge of one of the dredge units at the dam site. In 1935, he worked as assistant mechanical engineer on a major project for the Missouri State Penal and Eleemosynary Institutions.

In 1937 Mr. Williams joined The Trane Company as manager of the Plan Department. From 1937 to 1947 he also had charge of the Trane Student Training Classes for graduate engineers. He has authored several heating, air conditioning and refrigeration articles which have appeared in this magazine and other publications.

Temperature reinforcing bars should be installed according to the structural engineer's instructions. The concrete slab should conform to the following specifications:

Strength, 4000 lb.

Fig. 1. Schematic piping diagram of brine system.

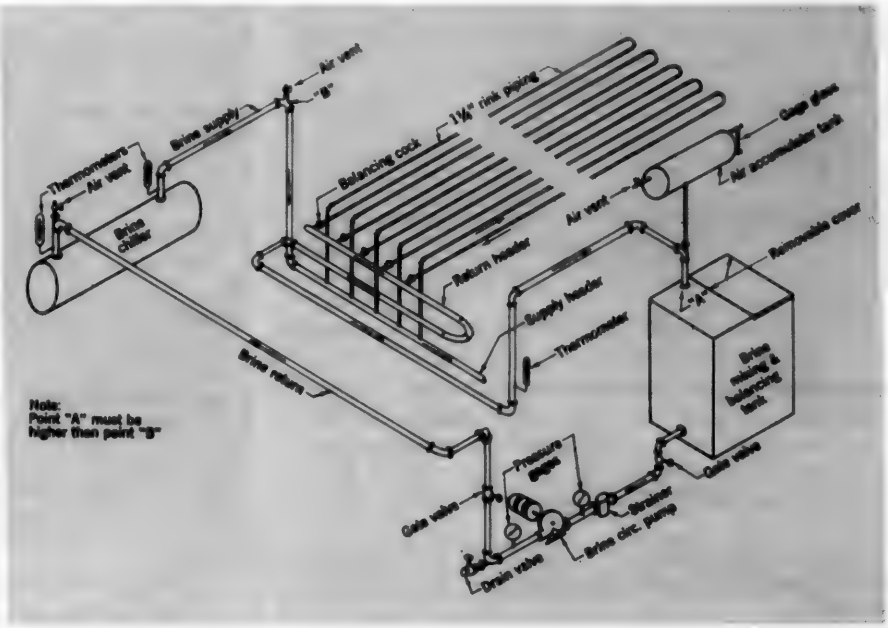
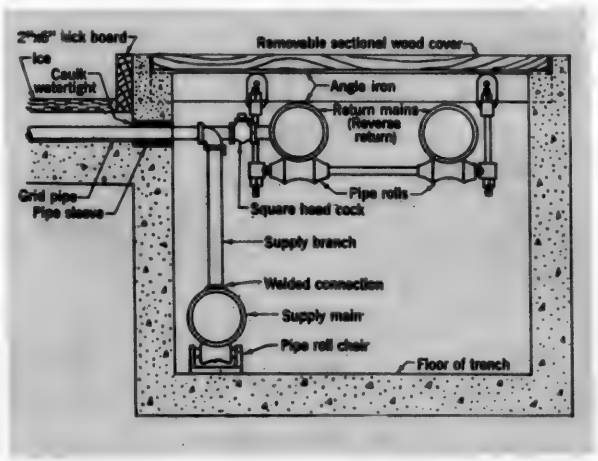


Fig. 2. (below) Detail of pipe trench.



Slump, 4 inches max., and 3 inches min.

Water-cement ratio, 5 to 6 gal per 100 lb sack cement

Aggregate, coarse $\frac{3}{8}$ inch (square opening)

Rink Piping System

The selection of the type of rink piping for a particular installation should be given careful consideration. All joints in the rink piping system should be welded and pressure tested for leaks before concrete is poured around pipes.

Rink piping must be installed absolutely level with no high points where air might collect. The presence of air in a rink piping system is objectionable, for it may restrict the flow of the brine as well as increase the danger of corrosion. To insure proper air removal, the return header should be installed at a higher level than

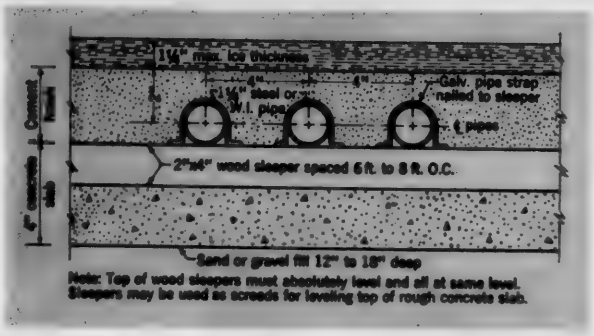

1¼" max. ice thickness
4"
4"
1¼" steel or W.I. pipe
Galv. pipe strap nailed to sleeper
2"x4" wood sleeper spaced 6 ft. to 8 ft. O.C.
Sand or gravel fill 12" to 18" deep
Note: Top of wood sleepers must absolutely level and all at same level. Sleepers may be used as screeds for leveling top of rough concrete slab.

Fig. 3. Detail for installing grid piping.

the supply header. By installing the headers in this manner the air will be carried along with the flow of water and free venting can be accomplished with a minimum number of vents.

Sizing, spacing, and layout of rink piping must be determined by an analysis of the refrigeration requirements, and the allowable temperature rise and pressure

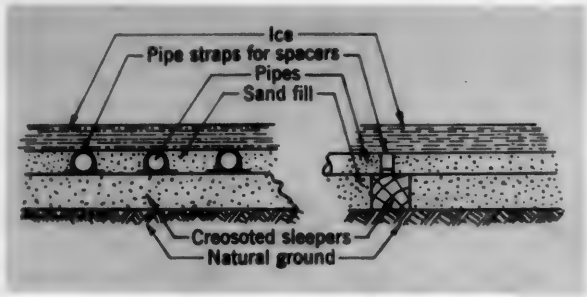


Fig. 4. Open or sand fill floor.

drop of the brine to be circulated. Most rinks employ 1 or 1¼ inch pipes, with the center spacing varying from 3 to 4½ inches. 1¼ inch pipe on 4 inch centers is more commonly employed, but 1 inch pipe on 3 inch centers insures more uniform ice texture and freezing rate.

Rink piping is arranged in either a grid or hairpin pattern, depending largely upon the size and shape of the rink.

The grid pattern, Fig. 9, is installed with the supply and return headers on opposite sides of the rink, and is usually employed on large size rinks. To facilitate ease in balancing the flow of brine in each circuit, a reverse return should be used; if a reverse return is not used, then a balancing cock will be necessary for each of the pipe circuits.

The hairpin pattern, Fig. 10, is installed with the supply and return headers at the same end or side of the rink. Here again a reverse return is recommended to facilitate ease in balancing the system.

A general rule to follow in determining the pattern to use for the rink piping is to limit the length of the circuit to 360 to 370 lineal feet in order to maintain the temperature rise of the brine within reasonable limits with a minimum rate of brine flow.

There has been a considerable discussion between authorities on curling in both the United States and Canada as to the best method of installing the rink piping—longitudinally or crosswise of the rink. It is the writer's opinion, based on experience, that rink piping running crosswise of the rink gives the best results. The ice surface for curling rinks should be absolutely level, free from any ridges or grooves. Artificial ice will often develop slight ridges and grooves over and between the rink pipes due to occasional uneven freezing. If these slight ridges or grooves run crosswise of the rink, they do not affect the direction of the curling stone as the stone travels lengthwise of the rink when it is delivered by the curler. On the other hand, if the ridges or grooves run lengthwise, in the direction of the stone's travel, they could cause the stone to run straight along a ridge or groove, rather than curve as it should. These ridges and grooves are usually so slight that they do not offer any disadvantage to skaters.

The recommended temperature rise of the brine in a system is a total of 3 deg, allowing 2 deg rise in the rink piping and ½ deg in each the supply and return headers and piping. To keep the temperature rise in the supply and return piping to a minimum these pipes (except the headers in the pipe trench) should be insulated.

Portable Rink Piping

With the introduction of plastic pipe (virgin black polyethylene 1 inch I.P.S.) portable rink piping has come into existence for large size outdoor rinks, such as playgrounds which will be used for other recreational pur-

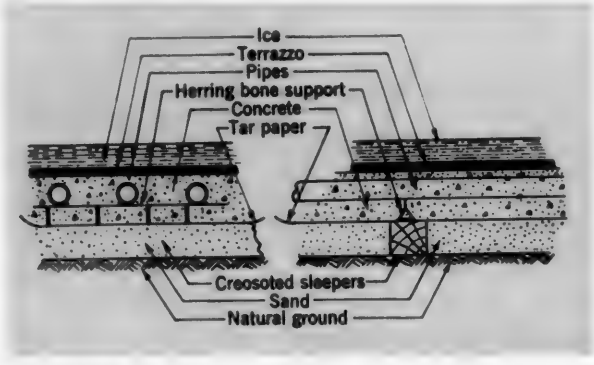


Fig. 5. Permanent or general purpose floor.

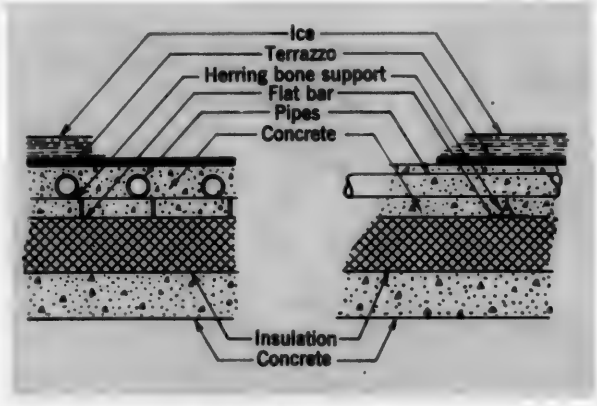


Fig. 6. All purpose floor.

Piping in a curling rink before finished floor is applied. Note piping straps for securing piping while flooring is being laid.

poses during late spring, summer and early fall. This plastic pipe is extruded in any desired lengths and should be ordered in lengths equal to the length or width of the rink to avoid intermediate joints.

The surface of the ground on which the plastic pipe is to be laid must be level by surveyor's instrument to avoid low points in the piping system. After the ground has been leveled, steel spacer bars are laid down at 6-ft to 8-ft centers. These bars (20 to 22 gage steel) are drilled with holes to receive pins welded to the pipe clips so as to space the rink piping on 3 inch centers. The spacer bars should be provided with spikes to prevent shifting once they are properly spaced. In case vapor barriers or insulation is required, it should be laid directly on the ground with the joints being sealed, and the spacer bars then laid on top of the vapor barrier or insulation. Steel pipe nipples are welded to the supply and return headers and stainless steel pipe clamps used to secure the plastic pipe to these nipples. Return bends are of high impact polyethylene furnished with integral adapters. The plastic pipe is secured to these adapters by special worm wheel type stainless steel hose clamps. Galvanized steel shields are placed over the plastic pipe to protect it from sharp skate blades.

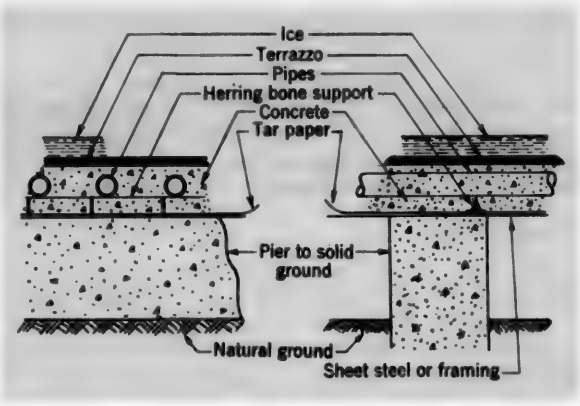


Fig. 7. Permanent or all purpose floor on piers.

After the rink piping has been properly installed and secured, washed sand is filled in between the pipes and leveled to the top of the rink piping.

Trenches are usually provided around the perimeter of the rink for storage of the plastic pipe and accessories when not in use.

Header Trench

The supply and return headers should be installed in a concrete trench constructed as shown in Fig. 2. While these trenches will increase the initial cost of the installation, they will in the long run save more than their cost. The trench should be provided with a floor drain or drains and the floor of the trench pitched to provide complete drainage.

The trench should be made large enough to accommodate the headers and supports, as well as to provide space for inspection and maintenance. The trench covers should be of heavy wood planking or ¼ inch steel, and built

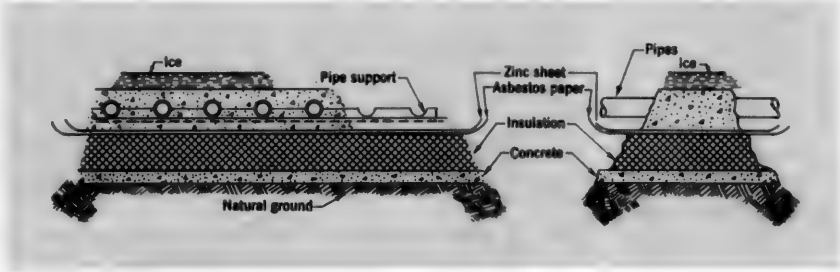


Fig. 8. Sections through Carpenter floor.

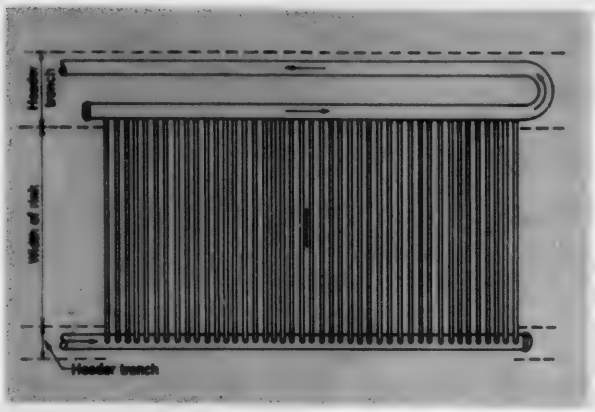


Fig. 9. Plan of grid pattern, cross flow, reverse return, three headers.

in sections with handles for easy removal. The supply and return headers and branch piping in the trench are not usually insulated; however, all supply and return piping outside of the trench should be covered with insulation of proper thickness for the temperature of the cooling medium being circulated.

Load Calculations

Heat must be removed from the rink floor to lower the floor temperature sufficiently to freeze water which is sprayed over it for making ice. This requires mechanical refrigeration, the amount of which varies according to several factors. These are: (1) type of enclosure or protection over the rink; (2) latitude where the rink is located; (3) length of the skating season; (4) uses to which the rink will be put, such as, hockey, public skating, and curling, and whether the usage will be light, average, or heavy. In addition, for outdoor rinks one must consider (5) orientation, sun effect, rain, snow and wind. Finally, (6) the latent heat of freezing the water and the ice thickness must be considered.

There is a wide variation of opinion among designers of ice rinks, judging from their installations, as to the amount of refrigeration to be installed for ice rinks. The tonnage calculated varies as much as 100% for similar rinks installed having the same general design conditions. It is difficult to compute on a theoretical basis the actual refrigeration load for an ice rink because of the many variable factors influencing the calculations.

The usual practice in the refrigeration industry is to allow one ton of refrigeration for so many square feet of ice surface. As a result of data taken on hundreds of actual installations of both indoor and outdoor rinks located all over the United States and Canada, many facts have been learned which have helped in establishing various rules of thumb relative to the tons of refrigeration required for various types of ice rinks.

Tables 1 to 5 are a compilation of this data reduced to a value of so many square feet of ice surface per ton of refrigeration. The capacities given are for ice thicknesses of ¾ to 1¼ inch and has taken into consideration components of all loads, including latent heat to freeze the water, heat load acquired by convection for the air over the ice surface, humidity load of air to ice, sum of ground, air and sun loads, and pull-down load in case of arena rinks where it is necessary at times to freeze the ice to required thickness in a relatively short period of time.

To use these tables one has only to know the average wet bulb temperature at the locality where the rink is located, and in case of outdoor rinks, the latitude. The average wet bulb temperatures may be obtained from the local weather bureau records.

Cooling Medium

To remove heat from the rink floor, an indirect refrigeration system is used whereby a secondary cooling

TABLE 1—LOAD SELECTION FOR A SHADED OUTDOOR RINK

General Purpose Concrete; Sandfill and Takeup Floor; No Pull Down Time; Ice Thickness, 1¼ Inches

Latitude, Degrees	Average Wet Bulb Temperature, Deg F.				
	35	40	45	50	55
	Sq Ft Ice Surface Per Ton of Refrigeration				
44-46	370	220	145	100	75
42-43	400	250	155	130	105
40-41	430	230	200	160	135

TABLE 2—LOAD SELECTION FOR INDOOR PUBLIC SKATING RINK

General or All-Purpose Concrete and Sandfilled Floors; No Pulldown Time; Ice Thickness, 1¼ Inches

Service	Average Wet Bulb Temperature Indoors, Deg F.				
	35	40	45	50	55
	Sq Ft Ice Surface Per Ton of Refrigeration				
Heavy	710	400	272	182	132
Average	880	520	330	230	170
Light	960	565	360	250	180

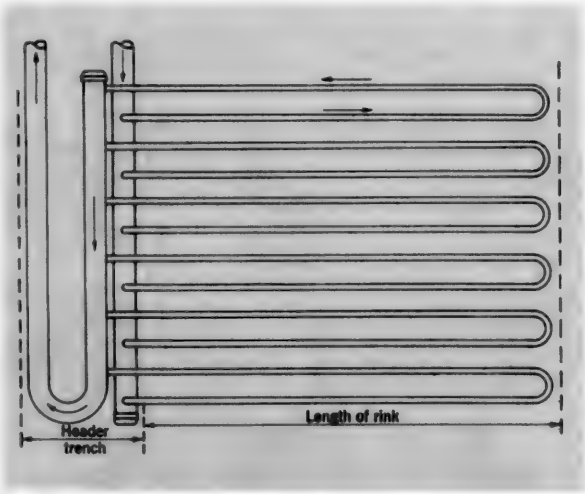


Fig. 10. Hairpin pattern of grid with lengthwise flow, reverse return, three headers.

medium (usually calcium chloride brine) is circulated through the rink piping. This brine is cooled by mechanical refrigeration. Before the quantity of brine to be circulated may be calculated, it is necessary to determine the freezing point of the brine. This is usually established at a point approximately 10 to 15 degrees below the lowest temperature to which the brine may be subjected. For instance, consider an outdoor rink installed in a locality where the outdoor winter design temperature is —10 degrees. The brine should be selected for a —20 degree freezing temperature. Referring to Table 6, brine with a freezing point of —20 degrees would have a specific heat of 0.676 and a specific gravity of 1.240. The total required amount of brine, to be circulated would be:

$$B = \frac{H}{8.33 \times 60 \times S \times G \times T}$$

where B = brine circulation, gpm,
H = heat to be removed, Btu per hour,
= 12000 Btu per hour per ton
8.33 = pounds per gallon,
60 = minutes per hour,
S = specific heat of brine, Btu per pound per degree
G = specific gravity of brine,
T = recommended temperature rise of brine
= 3 deg.

$$B = \frac{1 \times 12000}{8.33 \times 60 \times 0.676 \times 1.24 \times 3}$$

= 9.55 gpm per ton of refrigeration

In order to be able to control the hardness of the ice, the brine should be supplied to the rink piping at 14 deg F.

A solution of ethylene glycol (with rust inhibitor) and water (see Table 7) may be used as a cooling medium instead of calcium chloride brine for smaller rinks, such as curling rinks up to four sheets of ice. The initial cost of the ethylene glycol solution would be higher than calcium chloride brine but it is less corrosive to pipe. The higher initial cost may be justified to a great extent inasmuch as less expensive black steel pipe can be used instead of wrought iron pipe with a comparable life expectancy. Also a less expensive chiller of standard construction (copper tubes and steel baffles) may be used instead of an all-steel constructed chiller which would be required with calcium chloride brine. Consideration should also be given to the space requirements. Considerably less space for equipment is required for an ethylene glycol system than is required for a calcium chloride system.

Refrigeration Equipment

Having established the tonnage and brine circulation required, the next step is the selection of the refrigeration and auxiliary equipment, consisting of compressor, condenser, brine chiller, heat exchanger, controls, circulating pump, pipe and fittings. See Fig. 11.

TABLE 3—LOAD SELECTION FOR A COLISEUM OR SPORTS ARENA

All-Purpose Concrete Floor; Ice Thickness, ¾ Inch

Pull Down Time, Hours	Average Wet Bulb Temperature Indoors, Deg F.				
	35	40	45	50	55
	Sq Ft Ice Surface Per Ton of Refrigeration				
7-9	200	120	80	55	40
10-12	295	175	115	80	60

TABLE 4—LOAD SELECTION FOR AN INDOOR HOCKEY RINK

General or All-Purpose Concrete and Sandfilled Floors; No Pull Down Time; Ice Thickness, ¾ Inch

Average Wet Bulb Temperature Indoors, Deg F.				
35	40	45	50	55
Sq Ft Ice Surface Per Ton of Refrigeration				
860	500	325	226	162

TABLE 5—LOAD SELECTION FOR INDOOR CURLING RINK

Sand Fill Floor; No Pull Down Time; Ice Thickness, 1 inch

Average Wet Bulb Temperature Indoors, Deg F.				
35	40	45	50	55
Sq Ft Ice Surface Per Ton of Refrigeration				
1100	685	425	300	210

TABLE 6—PROPERTIES OF CALCIUM CHLORIDE BRINE

Freezing Temp. of Solution, Deg F	Lb of $CaCl_2$ Per Gal. of H_2O	Specific Heat of Solution	Specific Gravity of Solution at 68 Deg
0	2.43	.727	1.180
—5	2.72	.707	1.200
—10	2.86	.699	1.210
—15	3.09	.687	1.225
—20	3.29	.676	1.240
—25	3.43	.669	1.250
—30	3.58	.663	1.260

TABLE 7—PROPERTIES OF ETHYLENE GLYCOL SOLUTION

Freezing Temp. of Solution, Deg F	Per Cent of Ethylene Glycol by Vol.	Specific Heat of Solution	Specific Gravity of Solution at 60 Deg
0	.307	.86	1.06
—5	.350	.85	1.07
—10	.378	.84	1.07
—15	.390	.825	1.07
—20	.420	.81	1.07
—25	.442	.80	1.08
—30	.452	.79	1.082

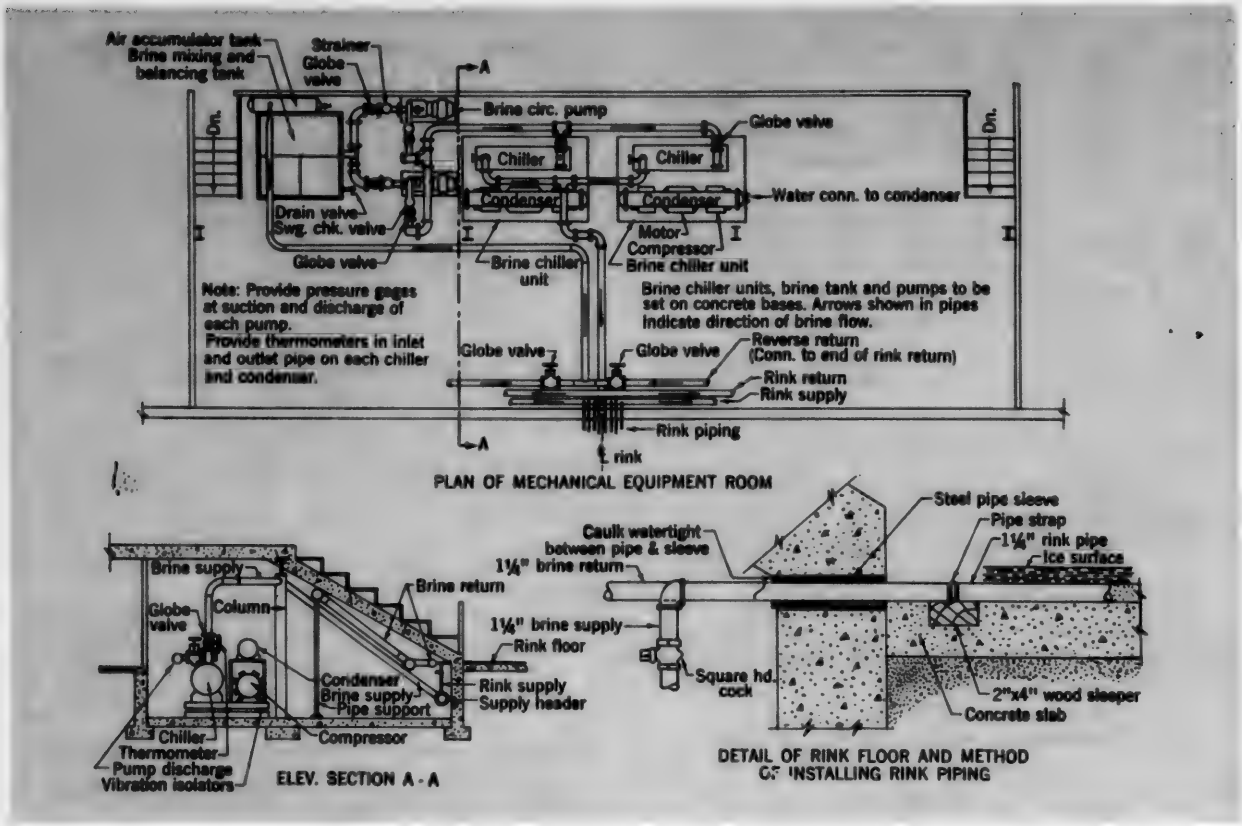


Fig. 11. Typical equipment room layout for an ice rink.

The refrigeration equipment must be suitable to chill the cooling medium through the desired range; such as 14 to 17 deg, or 16 to 19 deg. The lower temperature of brine mentioned should be employed during initial freezing and the higher temperatures (17 or 19 deg) should be employed as holding temperatures after the ice is frozen. Equipment is available which combines all the refrigeration equipment in a single package that can be selected with the proper size compressor, drive, condenser, chiller, heat exchanger and controls to handle the desired refrigeration requirements. Freon-22 is most economical for the desired temperature range of operation.

The *compressor* under the above stated conditions will operate at approximately +5 deg suction temperature. At this suction temperature a relatively large compressor is required for a given tonnage of capacity.

The *condenser* (water cooled) is selected for approximately 85 deg condensing temperature in most cases, as water is usually available during fall, winter and spring at from 55 deg to 65 deg F. The available condenser water should be closely checked in order that the unit be properly and economically selected. The condenser will be of about average size.

Air cooled condensers may be used instead of water cooled condensers. These must be provided with dampers operated by a damper motor equipped with auxiliary switches for controlling 2-speed fan motors.

Evaporative condensers may be used in lieu of either the water or air cooled condenser. These may be of the conventional type with bare tube coil except that, due to the fact that the condenser will be taking in outdoor air and be in operaion during below freezing temperatures, a by-pass duct arrangement should be provided between the condenser discharge and fresh air inlet equipped with mixing dampers controlled by a temperature controller with bulb located in mixed air chamber set at a temperature of approximately 60 deg to prevent freezing air coming in contact with the spray water. A heating coil should also be installed in the water pan of the condenser to prevent water freezing in the pan during below freezing weather. This heater may either be of the steam type or of the electrical immersion type. The temperature of the water should be controlled at approximately 60 deg.

The by-pass duct should be used only if the condenser is located indoors.

If the evaporative condenser is located outdoors, a fresh air damper should be installed in connection with the unit controlled by the head pressure. A heater in the water pan as described above should also be provided.

The *motor* is relatively small in size since the compressor is operating at a low suction and a low condensing temperature. It must be large enough, however, to handle the initial pull-down load.

The *chiller* must be constructed of proper material to handle the cooling medium. If calcium chloride brine is used, steel tubes must be used. Since the system is normally designed to handle a high rate of brine flow, the chiller must have wide baffle spacing in order to hold the pressure drop to a reasonable value. Due to lower heat transfer rates with brine, the chiller is usually larger

than normal. If ethylene glycol is selected, standard chiller construction, with copper tubes, may be used.

The over-all balance of the components, therefore, means a large compressor, large chiller, average size condenser and a small motor.

Controls

The standard type of cold generator control panel, either pneumatic or electric, can be used for these units. The unit capacity is modulated on the basis of the cooling medium temperature entering the chiller. The modulating temperature controller must be special for the low operating temperatures. The low limit anti-freeze temperature controller should be set for 0 deg. This controller setting, based on the same cooling medium temperature for both freezing and holding, has been found to be satisfactory.

Some engineers desire to maintain different cooling medium temperatures for freezing (12 deg) and for holding (19 deg). This would mean less running time for the refrigeration machine which would result in more economical operation. This can be accomplished by using the standard control panel by using two temperature controllers with a manual switch to change the control to either temperature controller, depending upon operating conditions desired.

It is often economical on large installations to use two complete refrigeration machines with sequence control. They can be operated from a common modulating temperature controller, loading and unloading in sequence. One unit will normally carry the holding load, which will mean lower operating costs.

Accessories

Standard accessories, such as vibration isolaters and mufflers, are common with these units. Crankcase heaters are usually recommended since the compressor is installed in a relatively cold space. If the refrigeration equipment is not furnished as a compact package unit as described above, and the chiller or evaporator is located some distance from the compressor, an oil separator, installed in the hot gas discharge line, is recommended in order to return to the compressor a great percentage of the oil carried over from the compressor without being first carried through the complete refrigeration cycle.

Centrifugal Compressors

Centrifugal compressors are becoming popular for larger arena or coliseum type rinks. This type of unit comes as package type unit including a multi-stage centrifugal compressor, shell and tube condenser, and shell and tube type chiller or evaporator. The units are built complete with hermetically sealed or open type motor with all components mounted on a common frame. The refrigerant used is Freon-22 and the unit has complete modulated capacity control.

Pumping Equipment

For calcium chloride brine application, the circulating pumps should be of all-iron construction with mechanical seals and single stage design. Two types are available: (1) horizontally split case, double suction usually for heavy duty pumping; (2) end or side suction. Both types are for direct drive through flexible couplings and mounted on a base plate with their motors. End suction pumps are also available in the close coupled type.

Two circulating pumps are recommended for ice rink application. Each pump should be selected for handling the total circulation for the complete rink. The pumps should be piped in parallel and valved in such a manner so that either pump may be operated independently of the other in case of a breakdown of one or the other pump.

The condenser water pumps may be of the same general type as required for brine except they may be of cast iron casings bronze fitted.

To select the pump it is necessary to know the quantity (gpm) of brine to be circulated (see Formula 1) and the dynamic head (static head plus friction head) of the system. The friction head or loss is composed of the sum of the losses of the pipe and fittings through the supply line from the pump, through the chiller, the supply main, the rink supply header, one circuit of rink piping (the resistance of all the circuits are parallel resistances), the return header, the return main to the brine tank and the pump suction pipe and fittings from the brine tank to the pump suction. The static head is the difference in elevation between the lowest level and the highest level of brine in the system.

Having established the static loss and friction losses, the total dynamic head (static plus friction) against which the pump must operate can be determined. The head established thusly is for water (assuming water friction tables have been used) and this must be corrected for brine as shown in Table 8. By referring to the pump rating curves for the type of pump selected, the pump and motor horsepower can be determined.

TABLE 8—RATIO OF PRESSURE LOSS COMPARED TO 60 DEG. WATER

Freezing Temp. of Solution, Deg F.	Ratio of Press. Loss
0	1.15
—5	1.16
—10	1.17
—15	1.18
—20	1.20
—25	1.22
—30	1.73

Brine Solutions

Calcium chloride brine, generally used as a cooling medium for ice skating rinks, is mixed to the specific gravity corresponding to the temperature of the freezing point selected (see Table 6). Commercial flake calcium chloride is used which has an average purity of 78 to 80%. The solution is prepared by mixing the proper number of pounds of calcium chloride with water in the correct proportions. The total quantity of brine in the system can be calculated by figuring the total internal volume of the piping system (see Table 9) plus the internal volume of the chiller (usually listed in the chiller specifications) to which about 10% should be added for valves and fittings.

TABLE 9—LINEAL FEET OF PIPE PER CUBIC FOOT OF VOLUME

Pipe Size, Nominal, Inches	Lineal Feet Per Cubic Foot of Volume
1	166.6
1¼	96.275
1½	70.733
2	42.913
2½	30.077
3	19.479
3½	14.565
4	11.312
5	7.198
6	4.984
8	2.878
10	1.785

Gas Absorption

Exposure to air will cause the brine to gradually absorb carbon dioxide which tends to neutralize it and make it slightly acid. Acids, of course, will corrode the metal in the brine system. To prevent this tendency of the brine to turn to acid, a corrosion inhibitor is used. Sodium bichromate together with caustic soda will help to keep the alkalinity of the brine. About 50 lb of commercial sodium bichromate, about 15 lb of caustic soda dissolved in about 10 gallons of water, well stirred and dissolved, will make enough inhibitor to treat approximately 3750 gallons of brine, or in same proportions for quantity required for the particular system.

For freshly prepared brine it is not necessary to add the caustic soda to the sodium bichromate unless there is a necessity for adjusting the pH value.

Brine Tank

Today the brine tank is not used to store reserve refrigeration capacity as it was in the original ice rink days. The first rinks were built using an open brine tank in which pipe coils were immersed and the refrigerant expanded into the coils. With the shell and tube chillers, practice has proven that the reserve capacity should be included in the refrigeration equipment.

Brine tanks are still used, however, but serve a different purpose. They are used as a balance and mixing tank for the brine. The tank should be located so that the operating brine level in it is at the highest point of the system. The bottom of the brine tank should be set so that it is always above the brine pump suction connection to insure a constant prime on the pump. The tank should be open to the atmosphere and arranged so that the brine returning from the system dumps into the tank (see Fig. 1). The quantity of the brine circulated will usually determine the size of the tank if it is to be used as a combination balance and mixing tank. It should therefore be large enough to hold as many gallons as is circulated through the system per minute when about three quarters full. For a circulation of 1000 gpm, therefore, the brine tank should hold 1330 gallons when full, requiring a tank with a volume of 177 cu ft which is equivalent to a 6 ft by 6 ft tank 5 ft high. The tank should be constructed of ¼ inch plate steel painted inside and outside with a rust resistant paint.

Refrigerant Piping

Freon piping should be hard drawn copper and should be not lighter than Type L for field assembly, or Type M for factory assembly. Joints should be sanded, cleaned, fluxed, and soldered using a silver base alloy. For pipe sizes larger than 4⅛ inch O.D., black steel pipe may be used with welded joints.

For ammonia, black steel or wrought iron pipe should be used. On low pressure lines, standard full weight, schedule 40 pipe is permissible. On high pressure lines, extra heavy, full weight, schedule 80 pipe must be used. Welded joints should be used as far as practicable in the installation.

All piping should be in accordance with ASA B36.10 1950 Piping Specifications and ASA B9.1 Safety Code for Mechanical Refrigeration 1950.

Selection of refrigerant pipe sizes shall be in accordance with usual ACRMA equipment standards for the refrigerant selected.

Insulation

All brine supply and return mains, valves, as well as refrigeration suction piping and fittings should be insulated with 2 to 3 inch thick solid type cork or some inorganic insulating material. Moulded insulation to fit pipe and fittings are available in cork and many other types of material. The insulation joints should be well sealed and the exposed surfaces may be painted or covered in accordance with the designer's specifications.

The brine chiller or evaporator, unless factory insulated, should be insulated with 4 inch thick cork board or other inorganic type insulation. The back surface of each block should be dipped in hot asphalt and pressed firmly to the chiller shell. Butting edges must be thoroughly sealed with hot asphalt. The insulating blocks shall be banded with galvanized or copper wire to secure in place until outer finish is applied. A good protective vapor seal should be applied to the outer surface of the insulation. Outside of the vapor seal should be a finish of two coats of Portland cement. The first coat should be than and the surface well scratched before the second coat is applied. The outer coat of cement may be covered and painted in accordance with the designer's specifications.

The brine tank should be insulated with 2 to 3 inch thick cork board installed and finished in the same manner as hereinbefore described for the brine chiller.

Condensation and Fog Problem

In the early fall and late spring some indoor rinks are troubled with condensate dripping from the roof structural members and with fog forming over the ice surface due to a high internal latent heat produced by skaters and spectators. This is particularly true in arena and coliseum type rinks. Curling rinks are not apt to develop this sort of trouble due to the fact there is a fewer number of players and the spectator area is separated from the rink house by glass partitions.

To overcome this problem it is necessary to install dehumidifier units to remove the moisture from the air and lower the dew point temperature of air in the rink below the temperature of the ice surface and structural members. Brine from the rink piping system may be supplied to the dehumidifier coils. These dehumidifiers should be provided with defrosters for the coils.

Auxiliary Equipment

In a sports arena or coliseum type installation it becomes necessary to remove the ice surface as quickly as possible to change the floor surface so that it will be suitable for sporting events other than skating. To accomplish this an *instantaneous type heat exchanger* will be required. The heat exchanger should be selected to heat the brine at the rate it normally circulated to the rink piping. The heat exchanger and pump should be connected to the supply and return piping to the rink piping and valved in such a manner so as to by-pass the chiller and the balancing and mixing tank so that a minimum amount of brine would have to be heated. An expansion tank should be installed in connection with the heating circuit. By heating the brine and circulating it through the rink piping the slab will be heated sufficiently to loosen the bond between the ice and floor surface. The ice may then be broken up and scraped off of the floor and stored where it will melt and the water drained to the sewer.

Heat will be required in the equipment room to prevent freezing the condensate water in extremely cold weather. A unit heater will serve this purpose very well. It may also be necessary to provide heat for spectators also in an arena or coliseum type installation.

A cold water line is necessary for various maintenance needs and to supply cold water for spraying the rink. Sufficient length of *hose, preferably 1 inch size*, a *fine spray nozzle*, a power *ice planer* or resurfacer, a *tractor* to pull the planer, a *set of snow pushers* with steel edges, a set of three or four *squeegees 5 or 6 feet long*, and a rubber-tired *hot water cart* for resurfacing the planed surface.

A snow pit should be placed at one end of the rink or at some convenient location large enough to handle the scraped off snow, planed ice, or for complete ice removal.

The ice surface for curling rinks must be pebbled in order to reduce the friction and to break the partial vacuum created by the concave bottom of the curling stone. To provide this kind of surface, warm water is sprinkled on the ice surface which freezes in minute blisters. A *pebbling device* consisting of a small tank, with shoulder straps for carrying, to which is attached a short hose with a sprinkler head on the end. must be provided.

Maintaining The Ice Surface

Regardless of the type of rink floor installed, when the plant is first placed in operation, the equipment should be operated long enough for a sharp frost to appear on the surface. Then the entire surface should be uniformly flooded with a fine spray nozzle. This process should be repeated until a ½ inch thickness of ice is built on rigid type floor, or ¾ inch thickness on a sand filled floor. The surface should not be frozen colder than necessary after this build-up, as cracking may take place.

Too often, due to incompetent ice making, improper sprinkling equipment, or deep cutting of the ice during skating, the ice becomes uneven and excessively thick. There may be a variation of several inches in the thickness of the ice across the rink, but the resulting variation in the condition of the ice is more serious. The thicker the ice, the greater are the refrigeration requirements. For example, under assumed conditions where 18 deg brine would be cold enough to hold a 1½ inch thickness of ice, calculations show that 7.5 deg brine would be required should the ice be permitted to build up to 6 inches thick. In other words, excessive ice thickness acts as an insulation.

Since ½ to 1½ inch thick ice is satisfactory for skating and is the most economical thickness to freeze and hold, the ice surface should be planed periodically to maintain the desired thickness.

It has been determined that hot water at approximately 130 deg sprayed on the ice makes a "faster" surface which is most advantageous for a curling rink. However, this would not particularly be beneficial to a rink used strictly for public skating.

TABLE 10—WINTER WET BULB DESIGN TEMPERATURES

State	City	Wet Bulb Deg.
Alabama	Mobile	66
Arizona	Phoenix	47
California	Fresno	47
	San Diego	54
Colorado	Denver	30
District of Columbia	Washington	36
Florida	Jacksonville	62
	Miami	70
Georgia	Atlanta	50
Idaho	Boise	35
Illinois	Chicago	34
Kentucky	Louisville	39
Louisiana	New Orleans	67
Massachusetts	Boston	35
Michigan	Detroit	32
Minnesota	St. Paul	28
Missouri	Kansas City	34
	St. Louis	37
New Jersey	Newark	35
North Dakota	Bismarck	25
Oklahoma	Oklahoma City	40
Oregon	Medford	43
Pennsylvania	Pittsburgh	36
Tennessee	Memphis	50
Texas	Amarillo	50
	Dallas	41
	El Paso	42
	Houston	50
	San Antonio	45
Washington	Seattle	45

Example of Load Calculations

Problem

An outdoor shaded skating rink to accommodate 800 skaters located at Kansas City, Mo., in Latitude 39° N.

Solution

The size of rink should be 800 × 30 = 24,000 sq ft, equivalent to a size of 130 feet wide by 185 feet long. Referring to Table 1 the tonnage would be

$$\frac{24{,}000}{160} = 150 \text{ tons at 50 deg W.B.}$$

The average winter outdoor design temperature is —10 deg and the lowest outdoor temperature ever recorded is —22 deg. It is therefore recommended to use calcium

Ice rink header piping in trench. Note square headed cocks on supply pipe to each circuit for balancing brine flow.

chloride brine with a freezing temperature of —25 deg. Referring to Table 6, brine with —25 deg freezing point would have a specific heat of .669 and a specific gravity of 1.250, and the mixture would consist of 3.43 lb of commercial flake calcium chloride to one gallon of water. The total gpm of brine would be

$$\frac{150 \times 12{,}000}{8.33 \times 60 \times .669 \times 1.250 \times 3} = 1435 \text{ gpm}$$

Assume that city water at 60 deg is available for condenser water, the quantity required would be, based on an 85 deg condensing temperature

$$\frac{150 \times 28.8}{15} = 288 \text{ gpm}$$

For a rink of this size, it would be more economical from an operating standpoint to use two cold generators as one unit would probably have sufficient capacity to handle the holding load under favorable conditions.

The rink piping should be run lengthwise of the rink with the supply and return headers running crosswise of the rink. It is suggested that one circuit consist of two pipes (1¼ inch pipe on 4 inch centers). In other words, one circuit would run from the header end to the opposite end through a return bend and back to the header end of the rink. The number of circuits required would be

$$\frac{130 \times 12}{4 \times 2} = 195 \text{ circuits or } \frac{1435}{195} = 7.4. \text{ gpm per circuit}$$

The size of the balancing and mixing tank would be

$$\frac{1435}{7.5 \times .75} = 256 \text{ cu ft or } 7 \text{ ft} \times 7 \text{ ft} \times 5\tfrac{1}{4} \text{ ft high}$$

See drawing of a typical layout of an equipment room for an ice skating rink, Fig. 11.

Estimated Installation Costs

The following costs do not include the building housing the rink, nor the ground on which it stands. However, they include the installed floor, refrigeration cycle, brine floor piping and building housing the refrigeration machinery only.

Take-Up Rinks on leveled, rolled, hard ground or macadam, $5 to $6 per sq ft of ice surface

Permanent Rinks including concrete deck-type floor and sand fill around rink piping, $7 to $8 per sq ft if ice surface

Extras: For wire fence enclosure, flood lighting, warming shelter, hockey boards, water supply and drain piping, flooding and ice maintaining equipment $.50 to $1.00 per sq ft of ice surface

Operating Cost and Income

Operating Cost (based on 120 days or 4 months of skating)

For *Utilities* (water, electricity and heat), $.10 per sq ft of ice surface.

For *labor* (caretaker, operator and extras), $.80 per sq ft of ice surface.

This is equal to a total of $.90 per sq ft of ice surface. For a 130 ft × 185 ft rink, the total operating cost per season would be approximately $21,600.

The above costs, of course, would vary due to difference in water and electrical rates and wage scale in the locality in which the rink is installed.

Income

The following is based on 60 free days per season for children.

480 children per day at $.25 × 60	$7,200.00
320 adults per day at $.60 × 120	23,040.00
Total suggested income per season	$30,240.00

References

1. ASRE Air Conditioning, Refrigerating Data Book, 1956-57.
2. Air Conditioning, Heating and Ventilating, October, 1956—Design of Ice-Skating Rinks, C. V. Bengle.
3. Special Report on Ice Rinks—A. M. Byers Company.

AIR CONDITIONING AND REFRIGERATION ESTIMATING GUIDE

The data in this and subsequent data sheets in this series are compiled to aid in the determination of the economic soundness of air conditioning or refrigeration installations with a minimum of effort. In releasing these data, York Corporation, York, Pa., subsidiary of Borg-Warner Corporation, York, Pa., warns of the risk of over-simplification always present in their use; the size and cost of any specific installation will almost always be more or less than that predicted on the basis of generalized information. Properly used and tempered with judgment, however, this information involves but a small risk.

Table 1—Air Conditioning and Refrigeration Load Factors

Type of Load	Factor
People	30 people per ton of refrigeration .03 tons per person
Lights	3 kw per ton of refrigeration .04 tons per kw
Motors	5 hp per ton of refrigeration .20 tons per hp
Walls, Floors, Ceilings	2500 sq ft per ton of refrigeration .40 tons per 1000 sq ft
Glass areas	1000 sq ft per ton of refrigeration 1.00 ton per 1000 sq ft
Circulated air	400 cfm per ton of refrigeration 2.50 tons per 1000 cfm
Refrigeration Service Factor[1]	20% of heat gain
Refrigeration Product Factor[2]	50% of heat gain

[1] Accounts for people working in, entering and leaving, lights, etc., in refrigerated area.
[2] Added to empty room to allow for product that is to be placed in the room.

Table 2—Compressor Horsepower-Evaporator Temperature Ratio

Evaporator Temperature, Deg F	Bhp per Ton of Refrigeration	Evaporator Temperature, Deg F	Bhp per Ton of Refrigeration
40	0.9	−35	3.0
25	1.1	−65	4.5
−5	2.0	−95	6.0

Table 3—Approximate Steam Rates

Inlet Pressure	Exhaust	Steam Rate, Lb per Hp per Hr
125 psi	5 psi	20
125 psi	26 in. Hg vac. cond.	13
5 psi	26 in. Hg vac. cond.	30

Table 4—Approximate Condenser Water Rates

Refrigerant	Condenser Cooling	Rate, Gpm per Ton
Ammonia	Cooling Towers	4
Ammonia	City Water	3
Refrigerant-12,-22	Cooling Tower	3
Refrigerant-12,-22	City Water	2
	55-deg F Well Water	1
All refrigerants ..... 30 gal-deg/min/ton		

Table 5—Approximate Condensing Surface

Type of Condenser	Surface, Sq Ft per Ton
Economizer for ammonia	16-24
Horizontal condenser for ammonia	5-10
Vertical condenser for ammonia	10
Economizer for R-12 and R-22	12-16
Horizontal condenser for R-12 and R-22	7-10

Table 6—Approximate Chilled Water and Brine Flow Rates

Water or Brine	Application	Flow Rate, Gpm per Ton
Chilled water	Air conditioning	2–3
Brine	General purpose refrigeration	4–7
Brine	Flaked ice machine and skating rink	10–20
Chilled water	24 gal-deg per min-ton	
Brine	28 gal-deg per min-ton	

Table 7—Approximate Conversion from Refrigerant 12 to Refrigerant 22 for a given Compressor Displacement

tons (R-22 system) = tons (R-12 system) × 1.61
bhp (R-22 system) = bhp (R-12 system) × 1.48

Table 8—Approximate Surface for Horizontal Coolers for Refrigerants

Refrigerant	Surface, Sq Ft per Ton
Ammonia	5–10
Refrigerant-12 or 22	7–10

Table 9—Short Form Refrigerant-12 Liquid Line Sizing

Refrigeration, Tons	Total Length of Liquid Mains, Feet				
	25	50	75	100	150
	OD Copper Tubing or Steel Tubing—Nominal Diameter, Inches*				
10	⅜	⅜	⅜	⅜	⅜
15	⅜	⅜	⅜	⅜	1⅛
20	⅜	⅜	1⅛	1⅛	1⅛
25	1⅛	1⅛	1⅛	1⅛	1⅛
30	1⅛	1⅛	1⅛	1⅛	1⅛
40	1⅛	1⅛	1⅛	1⅛	1⅛
50	1⅛	1⅛	1⅛	1⅛	1⅛
60	1⅛	1⅛	1⅛	1⅛	1⅛
70	1⅛	1⅛	1⅛	1⅛	2⅛
80	1⅛	1⅛	1⅛	2⅛	2⅛
90	1⅛	2⅛	2⅛	2⅛	2⅛
100	2⅛	2⅛	2⅛	2⅛	2⅛
125	2⅛	2⅛	2⅛	2⅛	2½
150	2⅛	2⅛	2½	2½	2½
175	2⅛	2⅛	2½	2½	3
200	2½	2⅛	2½	3	3
250	2⅛	3	3	3	3
300	3	3	3	3	3

*Sizes above horizontal lines are copper tubing OD. Sizes given below horizontal lines are IPS.
1. Condensing pressure above 70 psig.
2. Evaporator temperature above —50 deg F.
3. Approximately 5 lb drop through line.

Table 10—Brake Horsepower Requirements

Type of pump	Formula
Water pump	bhp = gpm × ft of head/1200
Brine	bhp = gpm × ft of head/1000
62% Eff. Fan	bhp = cfm × in. H_2O total pressure/4200

Table 11—Floor Area of Cooling Tower

Induced Draft Tower		Forced Draft Tower
R-12,-22 System	Ammonia System	
1 sq ft per ton	1.5 sq ft per ton	0.7 sq ft per gpm

Table 12—Short Form Refrigerant-12 Gas Line Sizing

Refrigeration, Tons	Suction Line—Total Length 150 Ft or Less				Discharge Line
	Suction Temperature, deg F.				
	—20	0	20	40	
	OD Copper Tubing or Iron Pipe IPS, Inches*				
10	4	3	2½	2⅛	1⅛
15	4	3	3	2⅛	2⅛
20	5	4	3	3	2⅛
25	5	4	4	3	2⅛
30	5	4	4	3	3
40	6	5	4	4	3
50	8	6	5	4	4
60	8	6	5	4	4
70	8	6	5	5	4
80	8	6	6	5	4
90	8	8	6	6	6
100	10	8	6	6	6
125	10	8	8	6	6
150	10	8	8	6	6
175	12	10	8	8	6
200	12	10	8	8	6
250	12	10	10	8	8
300	—	12	10	8	8
	Friction Drop, Psi per 100 Ft				
	.25	.50	.75	1.00	1.00

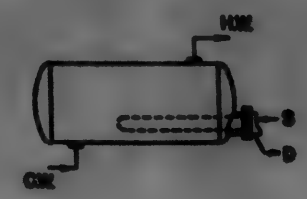
*Sizes above horizontal lines are copper tubing OD, below are IPS.

Next month's Data Sheet presents pricing data for quick estimating of refrigeration and air conditioning systems. The entire system, from compressor to filters, insulation, and cooling towers, is covered. Subsequent data sheets will present pricing data for specific applications, such as banks, dairies, food stores, hotels, textile mills, and theaters.

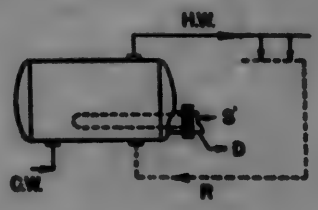
HOOKUPS FOR STORAGE WATER HEATERS

Key to diagrams

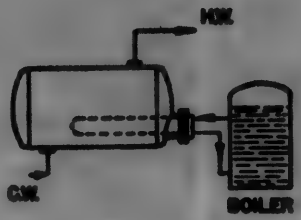
A — Auxiliary Heater
B — Booster Heater
D — Drip
E — Economizer
K — Condensate
R — Recirculation
S — Steam
CW — Cold Water
HW — Hot Water



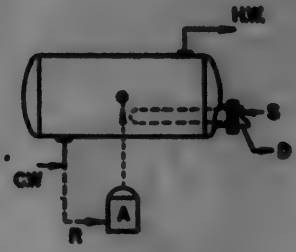
1. Standard Storage Heater Hookup.



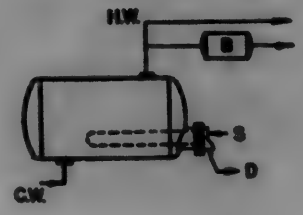
2. Utilizing Recirculating Line.



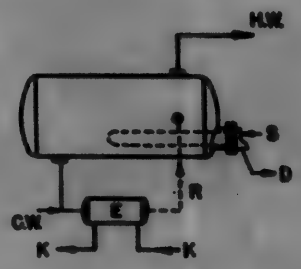
3. Submerged Storage Element under boiler water line.



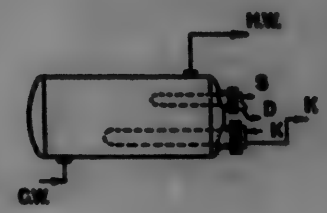
4. With Auxiliary Heater or Gas-fuge Burner.



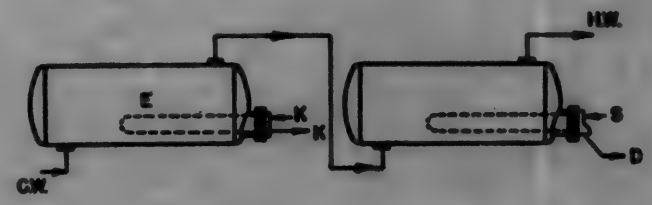
5. Booster Heater application.



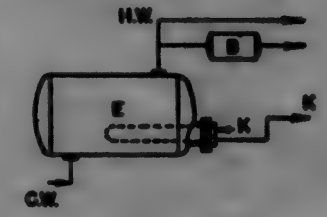
6. Addition of Economizer for cooling condensate.



7. Two-coil type—lower coil for condensate or exhaust steam.



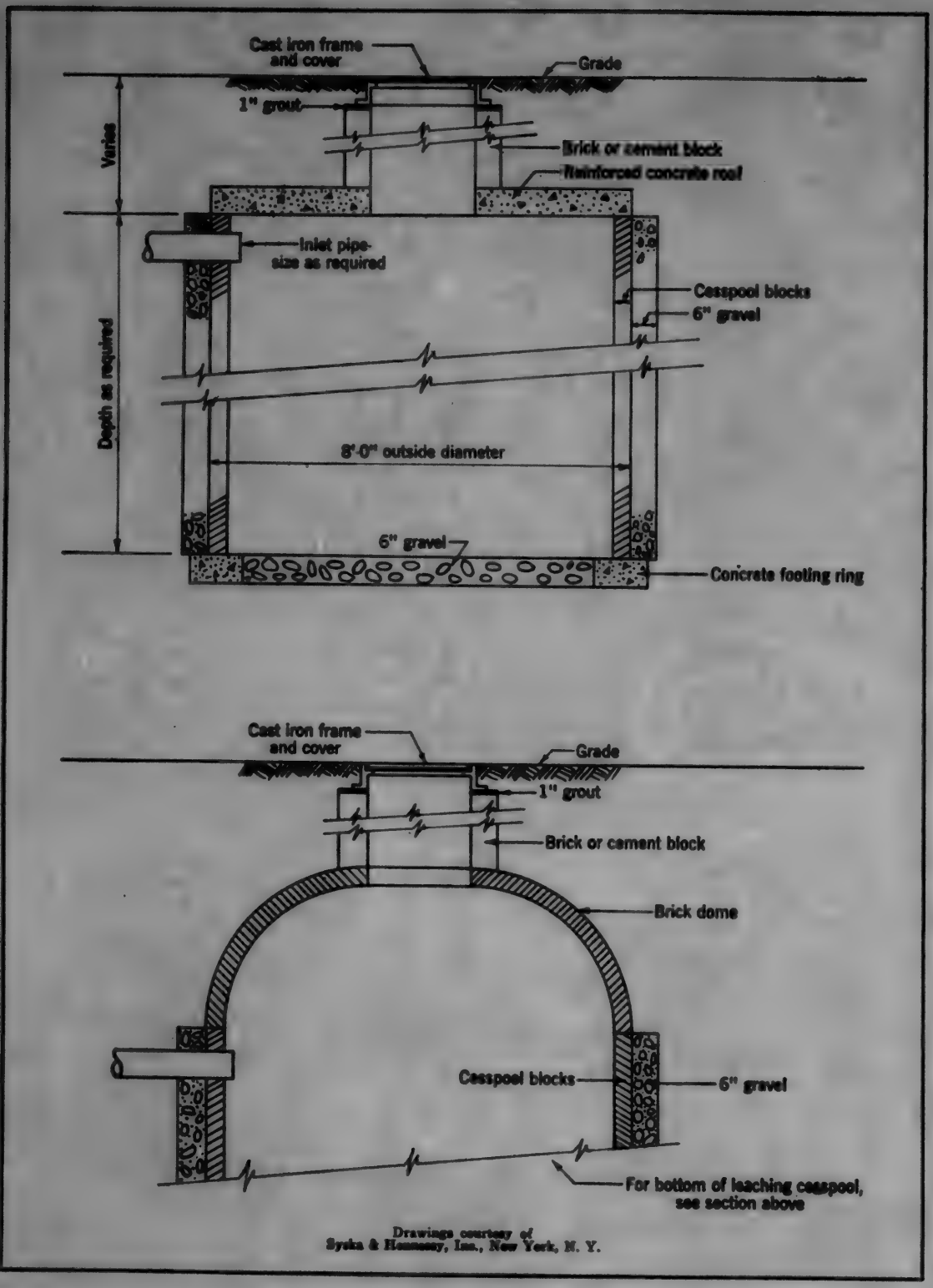
8. Storage Water Heater connected to Storage Type Economizer for cooling condensate.



9. Storage Type Economizer with Booster Heater.

Drawings courtesy of
Adco Division, Yuba Industries, Inc., Buffalo, N. Y.

DETAILS OF LEACHING CESSPOOL



Drawings courtesy of
Syska & Hennessy, Inc., New York, N. Y.

DETAIL SHEET—AIR CONDITIONING, HEATING AND VENTILATING

October, 1959

Economic opportunities are seen in

Waste Heat Reclamation For Laundries

One of the most important areas of cost reduction being considered by most laundries today is that of waste heat reclamation. For the design engineer employed or consulted by the laundry plant owner, this article points out avenues of investigation, including aids to the proper selection and installation of waste heat reclamation equipment.

JAMES J. COLEMAN
Chief Engineer, Laundry Div.
Patterson-Kelley Co., Inc.

THE prime objective of every laundry or linen service plant, regardless of size, is to operate as economically as possible.

In this light, the following information attempts to point out one of the most important areas of cost reductions being considered by most laundries today—waste heat reclamation. While there is much more to be said about the advantages of heat reclamation equipment and systems, the main emphasis here will center on the proper approach to some of the design factors to be considered in the selection and installation of waste water heat reclaimers.

The American Institute of Laundering issues periodically a pamphlet, "The Determination of Laundry Power Plant Requirements". A section of this pamphlet, devoted to hot water heating, states that the accepted ratio between hot water heating and the balance of steam heated equipment is 2 to 1; that is, ⅔ of steam used is for hot water heating and the remaining ⅓ is for presses, flatwork ironers and tumblers. It is natural, therefore, to concentrate on reducing the hot water heating load to a minimum.

This can be accomplished in part or in full by using one or all three of the following steps:

1. Reclaim heat from waste water presently discharged direct to the sewer;
2. Reclaim heat from flash steam vented from condensate receiving tank; and
3. Reclaim heat from exhaust steam from engines, steam-driven pumps, or other steam-driven prime movers.

To reclaim heat from waste water requires the installation of a waste water heat reclaimer, a specially designed heat exchanger. Water discharged from wash wheels, its primary function completed, will average in temperature from 130 to 110 deg F. The heat in this waste can perform a secondary function—that of preheating (to a minimum of 60 degrees) cold water required for the next operation. For example, for each 1000 gallons of hot water required, the 60-deg preheating of same would amount to 500,000 Btu's or heat units. The equivalent reduction in steam would be 567 pounds per hour at 100 pounds boiler pressure for heating fresh water through this temperature rise. This reclamation would be equivalent to approximately 16 boiler horsepower and a corresponding reduction in fuel for heating this water. Savings in fuel, of course, means money in the bank or, in another case, an increased figure in the work budget.

To make it easy to figure what a reclaimer can do for a plant, the company's engineers have designed a "slide rule" which has been converted to the form shown in Tables 1 and 2. Table 1 gives laundry data under conditions of no waste water heat reclamation. Table 2 outlines the savings resulting from a waste water heat reclaimer installation. Let's take a specific example. Suppose the poundage, with no heat reclamation, is set at 48,000 pounds per 40 hour week which would mean 1,200 pounds per hour or the maximum capacity of four 42 x 84 inch metal wash wheels. Now read across. This would require approximately 5,200 gallons of water per hour of which 3,480 gallons should be heated at 180 deg. Storage would be 2,241 gallons of 180-deg water, and the approximate size of the storage heater would be 60 inches in diameter by 204 inches long. The water heating load, that is from approximately 40 to 180 deg, would require 4,612 pounds of steam per hour at 100 pounds pressure or approximately 133.6 boiler horsepower, burning 10 tons of coal per 40 hour week, or 1,600 gallons of oil per

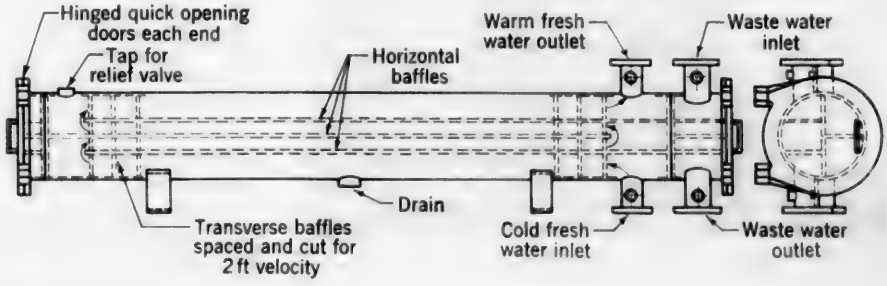

Hinged quick opening doors each end
Tap for relief valve
Horizontal baffles
Warm fresh water outlet
Waste water inlet
Drain
Transverse baffles spaced and cut for 2 ft velocity
Cold fresh water inlet
Waste water outlet

Fig. 1. Closed type waste water heat reclaimer is typical shell and tube heat exchanger.

TABLE I—LAUNDRY HOT WATER HEATING DATA WITH NO HEAT RECLAMATION EQUIPMENT

Pounds of Material Processed per 40-Hr Week	Total Water in Gph	Heating Capacity 40-180°F in Gph	Heater Storage Capacity in Gallons	Size of Storage Heater in Inches		Lb per Hr of 100-psi Steam Required	Equivalent Boiler Horsepower	Approximate Fuel Consumption per 40-Hr Week		
				Dia.	Length			Coal, Tons	Oil, Gal	Gas, Cu Ft
12,000	1,300	870	570	42	108	1,153	33.4	2.5	400	50,000
24,000	2,600	1,740	1,190	48	168	2,306	66.8	5	800	100,000
36,000	3,900	2,610	1,723	54	192	3,459	100.2	7.5	1,200	150,000
48,000	5,200	3,480	2,241	60	204	4,612	133.6	10	1,600	200,000
60,000	6,500	4,350	2,790	72	180	5,765	167.0	12.5	2,000	250,000
72,000	7,800	5,220	3,497	84	168	6,918	200.4	15	2,400	300,000
84,000	9,100	6,090	4,056	84	192	8,071	233.8	17.5	2,800	350,000
96,000	10,400	6,960	4,809	96	180	9,224	267.2	20	3,200	400,000
108,000	16,700	7,830	5,174	96	192	10,377	300.6	22.5	3,600	450,000
120,000	13,000	8,700	5,904	96	216	11,530	334.0	25	4,000	500,000
132,000	14,300	9,570	6,269	96	228	12,683	367.4	27.5	4,400	550,000
144,000	15,600	10,440	7,010	108	192	13,836	400.8	30	4,800	600,000
156,000	16,900	11,310	7,500	108	204	14,989	434.2	32.5	5,200	650,000
168,000	18,200	12,180	7,990	108	216	16,142	467.6	35	5,600	700,000
180,000	19,500	13,050	8,480	108	228	17,295	501.0	37.5	6,000	750,000
192,000	20,800	13,920	8,970	108	240	18,448	534.4	40	6,400	800,000

40 hour week, or 200,000 cubic feet of natural gas.

Upon installation of a waste water heat reclaimer, the same quantity of hot water is required heated from approximately 100 to 180 deg, instead of from 40 to 180 deg. This would reduce storage capacity to 1,723 gallons of 180-deg water, and the size of the heater would now be 54 x 192 inches. This would save 2,000 pounds of steam per hour and eliminate 57.33 boiler horsepower from water heating load. This reduced demand would save 4.24 tons of coal per 40 hour week, or 680 gallons of oil, or 86,000 cubic feet of gas for the same period.

Fig. 2. Open pit type waste water heat reclaimer.

The reduction in the size of the heater, that is, in the storage capacity, would be due to the fact that a quicker pickup would be available in that we are only heating now from 100 to 180 deg instead of from 40 to 180 deg; therefore, the smaller holding capacity.

Perhaps you wonder why any conscientious plant manager or owner ignores this potential in savings. Some do primarily because facts of this nature are not made clear to them. Others do because of a limited budget. The initial investment seems high and, if they are getting enough hot water for their process, they feel that any disruptions of present schedules do not warrant bringing up the subject with management.

A closed reclaimer designed for the instance mentioned above would cost approximately $4,500 including accessories, plus installation charge. The size of the unit would be approximately 22½-inch flange dia x 17-inch shell dia x 18 ft long. However, if unit fuel cost is multiplied by savings per hour, the cost would be amortized in approximately one to two years. However, for the next 18 to 20 years, each hour of operation would return an actual savings in less dollars spent for fuel and heat.

Types of Waste Water Heat Reclaimers

In general, there are two accepted designs of waste water heat reclaimers; namely, the open pit type and the closed type.

The closed type is a typical shell and tube heat exchanger with quick opening hinged doors at each end for inspection and cleaning of the waste water circuit. The waste water is pumped through the tubes from a waste water collection pit supplied by screened gutters from wash wheels.

Waste water is discharged at high velocity through eight tube passes. Its suction from the pit is through a rotating screen, the centrifugal force of which provides a channel of lint-free water around its periphery and, as a consequence, lint-free water to the reclaimer. The waste water—after transferring its heat to the fresh water—is discharged to the sewer.

Fresh water passes through a cylindrical baffled shell surrounding the tubes through which the waste water is pumped. When water is called for at the wash wheels, it

TABLE 2—LAUNDRY HOT WATER HEATING DATA WITH HEAT RECLAMATION EQUIPMENT

Pounds of Material Processed per 40-Hr Week	Heating Capacity 100-180°F in Gph	Heater Storage Capacity in Gallons	Size of Storage Heater in Inches		Load Reduction		Fuel Savings per 40-Hr Week		
			Dia.	Length	Lb per Hr of 100-Psi Steam	Equivalent Boiler Horsepower	Coal, Tons	Oil, Gal	Gas, Cu Ft
12,000	870	425	36	108	500	14.33	1.06	170	21,500
24,000	1,740	918	42	168	1,000	28.66	2.12	340	43,000
36,000	2,610	1,368	48	192	1,500	43	3.18	510	64,500
48,000	3,480	1,723	54	192	2,000	57.33	4.24	680	86,000
60,000	4,350	2,100	60	192	2,500	71.66	5.3	850	107,500
72,000	5,220	2,585	72	168	3,000	86	6.36	1,020	129,000
84,000	6,090	3,000	72	192	3,500	100.33	7.42	1,190	150,500
96,000	6,960	3,497	84	168	4,000	114.66	8.48	1,360	172,000
108,000	7,830	4,056	84	192	4,500	129	9.54	1,530	193,500
120,000	8,700	4,444	96	168	5,000	143.33	10.6	1,700	215,000
132,000	9,570	4,809	96	180	5,500	157.66	11.66	1,870	236,500
144,000	10,440	5,174	96	192	6,000	172	12.72	2,040	258,000
156,000	11,310	5,539	96	204	6,500	186.33	13.78	2,210	279,500
168,000	12,180	5,904	96	216	7,000	200.66	14.84	2,380	301,000
180,000	13,050	6,634	96	240	7,500	215	15.9	2,550	322,500
192 000	13,920	7,010	108	192	8,000	229.33	16.96	2,720	344,000

is introduced to the bottom of this cylindrical shell at one end, travels the entire length of the shell, back and forth, and is finally discharged under city pressure to the hot water storage heater. See Fig. 1.

The open pit type waste water heat reclaimer is simple in design, although more complicated from the maintenance angle. As shown in Fig. 2, it consists of a series of 1¼-inch OD #16 BWG copper tubing expanded into a heavy rolled steel tube sheet. This is securely bolted to a gasketed cast iron water chamber. The water chamber is also partitioned for a given velocity and heat transfer design, usually consisting of 10 to 18 full passes through the pit.

This reclaimer, or heating element, is submerged in a large sump pit of hot waste water approximately 2 inches below the water level, with waste water surrounding the outside of the tubes and fresh water, under city pressure, flowing through the tubes. The waste water enters the pit through a screened gutter, stratifying in the pit, with the stratus ranging from approximately 80 deg at the bottom to 135 deg at the top. This flow, therefore, preheats the water through the cooler strata and reaches maximum temperature before being discharged to the hot water heater from the upper stratus.

Waste water is held in the pit at the level 2 inches above the tubes by an overflow connection at the far end. This overflow connection is baffled to a point within 6 inches of the bottom of the pit and, as a result, only the cold or cooled waste water is discharged to the sewer and the hot water remains in the pit until cooled. Cleaning the pit-type reclaimer consists of lifting the floor plates, since the reclaimer is submerged below the floor, and hosing down the side walls and tubes at least once a week.

Pit size is determined by the size of the reclaimer, with clearance at sides and ends for piping and cleaning from the floor of the pit. The pit required for comparable size to the reclaimer of our example would be approximately 4 ft wide x 3.5 ft deep x 21.5 ft long. The closed reclaimer, on the other hand, would have a sump pit of approximately 3 ft wide x 6 ft long x 4 ft deep, approximately 25% of the holding capacity of the larger pit mentioned for the open pit reclaimer.

To install either type of reclaimer, break the plant sewer line at its point of discharge to the street sewer at an available point inside the washroom or adjacent to same. Construct the waste water collecting pit at this point and continue the sewer line from the opposite end of the pit to the street. Details of the sump pit will be furnished by the equipment manufacturer. If a closed reclaimer, you would pump from the sump pit through the reclaimer and return to sump pit for overflow to the present line to street. The open pit reclaimer, on the other hand, would be installed in the same manner without the pump. In other words, it would be the same as the plant's present gravity flow system to the sewer with the collecting pit installed in the line.

For installation on the fresh water side of the reclaimer, take the cold water line from the softener or fresh city supply and connect to the fresh water side of the reclaimer. The reclaimer warm water discharge would then be connected to the fresh water supply and from there to the hot water storage heater.

Heat Reclamation from Flash Steam

Other important design considerations in waste heat reclamation center primarily on the elimination of flash steam from condensate receiving tank and the collection of exhaust steam from various prime movers for heating water and reducing live steam consumption.

Visual inspection of the vent pipe from a condensate receiving tank will quickly indicate whether heat is being lost to the atmosphere. The steam generated by the plant's boiler, or produced from a central plant, is fed to operating machines (specifically, flatwork ironers, tumblers, and presses) at a pressure of 100 pounds or better. This steam pressure is necessary to provide a minimum temperature of 337 deg to this equipment in order to process clothes in a certain allotted time. Flatwork ironers, for example, are required to dry and press the damp flatwork in one pass through the machines. If steam chests are not up to required temperatures, second-pass operations must be made through the flatwork ironers, thereby cutting production in half.

Steam introduced to these machines at this pressure and temperature condenses and gives up its latent heat and energy to the machine. The condensate returning to the condensate receiving tank at high temperature would flash from, say, 275 or 300 deg down to 212 deg at the

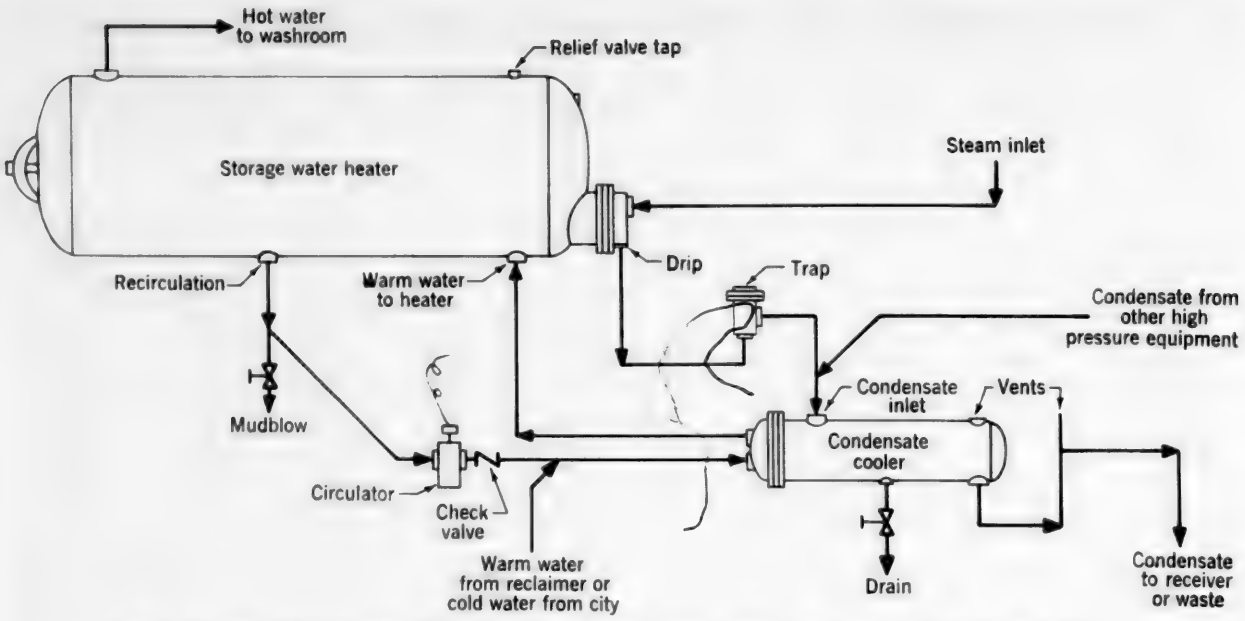


Fig. 3. Method for reclaiming heat in condensate which might otherwise be lost as flash steam.

receiving tank, as the latter is at atmospheric pressure. This flash would be approximately 12½% or one-eighth of that returned.

The method for reclaiming this waste heat, schematically diagrammed in Fig. 3, is designed around a heat exchanger placed at a point before the condensate receiving tank through which all the high pressure condensate would flow. This condensate cooler is designed to cool the condensate to a temperature of approximately 180 or 190 deg before entering the receiving tank. Fresh water for plant processes would then come from the reclaimer, or from the city supply, through the tubes of the condensate cooler and vent condenser and be discharged under city pressure to the hot water storage heater. When water is not being drawn, the condensate cooler would be continually circulated with the storage heater so that continual heat exchange would be prevalent.

The net result of an installation of this type, therefore, would be an increased temperature from the condensate cooler of process water. As an example of the flow with both waste water heat reclaimer and condensate cooler installed, consider that the water from the city comes in at 40 deg, goes through the reclaimer and comes out of this equipment at 100 deg, and continues on through the condensate cooler and picks up approximately 20 more degrees. The system is now feeding the plant's hot water heater with preheated water at 120 deg rather than the 40 deg if this equipment were not installed. The condensate cooler has added advantage in that it will cool the temperature of the condensate to a point which is easily handled by the boiler feed pumps, tend to prevent vapor bind, and increase the efficiency of the complete boiler return system.

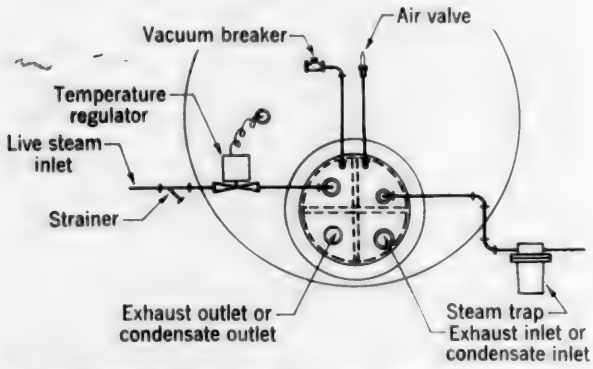


Fig. 4. Method of heat reclamation from exhaust steam showing an alternate method of cooling condensate directly in storage heater.

Heat Reclamation from Exhaust Steam

The final phase of heat reclamation, that of collecting exhaust from boiler feed pumps, steam engines and other prime movers, can also be designed to provide definite savings. The modern trend is to electrify equipment of this type, or eliminate the steam engines or generating plants, and buy the current direct from the city. However, if the plant is equipped with steam driven equipment, exhaust steam can be collected and used instead of live steam in the heating element of the hot water storage heater. If supply of exhaust is inadequate for full-capacity requirements, it may be augmented by live steam in a double-sectioned heating element. See Fig. 4 which also shows an alternate method of cooling condensate directly in the hot water storage heater in lieu of the separate condensate cooler or heat exchanger shown in Fig. 3.

The question often asked is should the condensate cooling element be put directly in the storage heater or be provided by a separate condensate cooler? The answer is simple. If purchasing a new hot water storage heater, put the separate condensate cooling coil in the heater as shown in Fig. 4. If the plant has an efficient hot water storage heater in service, add the separate heat exchanger or condensate cooler to this system.

These design factors provide a brief, but concise, introduction to methods of reducing the cost of hot water

TABLE 3—DATA FORM FOR LAUNDRY WASTE HEAT RECLAMATION EQUIPMENT

Waste Water Heat Reclaimer ..... ☐ Storage Heater ..... ☐ Condensate Cooler ..... ☐
Booster Heater ..... ☐
Metal Wash Wheels — Quantity and Size: _____
Wood Wash Wheels — Quantity and Size: _____

Wash Room operates ..... hrs. per week.

Average length of time I cycle including loading and unloading ..... minutes.

Estimated average temperature waste water discharge ..... °F.

Wash Room Formula

Break	....."water in machine @	.....F for	.....	minutes.
Suds	....."water in machine @	.....F for	.....	minutes.
Suds	....."water in machine @	.....F for	.....	minutes.
Suds	....."water in machine @	.....F for	.....	minutes.
Rinse	....."water in machine @	.....F for	.....	minutes.
Rinse	....."water in machine @	.....F for	.....	minutes.
Rinse	....."water in machine @	.....F for	.....	minutes.
Split	....."water in machine @	.....F for	.....	minutes.
Sour	....."water in machine @	.....F for	.....	minutes.
Blue	....."water in machine @	.....F for	.....	minutes.

Metered water ..... gallons for period from ..... to .....

Estimated total wash room water ..... GPH. Per cent hot .....

Maximum depth bottom of waste gutter to washroom floor level .....

Distance bottom of waste gutter to bottom of street sewer .....

Washroom location — 1st, 2nd or 3rd floor — Is there a basement? Yes ..... No .....

Does sewer from washroom run through same? Yes ..... No ..... Pipe Size .....

Distance inside bottom of gutter to basement floor .....

Water supply — city main or storage tank — Pipe Size ....." Pressure .....# Temperature .....°F.

Boiler: Type ..... Operating H.P. ..... Operating Pressure .....

If engine used; state H.P. and type .....

Exhaust pipe size ....." Exhaust back pressure .....#

Boiler Return System: Type ..... Vented condensate receiver Yes ..... No .....

Does condensate receiving tank vent pipe flash steam Yes ..... No .....

Is steam exhausted from other prime movers, i.e.; pumps, compressors, turbines, blowers, etc.

Give exhaust pipe sizes ..... Exhaust back pressure .....#.

heating in laundries and linen service plants, reducing boiler capacity required for the hot water heating operation, or adding to it by harnessing prevalent waste in the plant, increasing the overall efficiency of the operational heart of the plant—the boiler room—and supplying all of the hot water required, when required, and in quantities required.

To survey existing conditions and to determine the practicability of using the equipment discussed here, the design engineer employed or consulted by the plant owner can check the charted requirements shown in Table 3. The charted requirements, set up as a design aid by the company's engineers, are basic to most heat reclamation problems. Answers to these questions will provide the fundamental data required to determine overall factors for heat reclamation equipment, what the plant needs in regard to heat reclaimers, and the savings that equipment can provide in reclaiming "lost" heat. This eliminates "guesswork", gives management the proper and knowledgeable basis for making buying decisions, and rounds out the information required for the efficient design and construction of heat reclamation equipment.

The data form is arranged so that a three-way check is made on hot water requirements: First, by the number and size of wash wheels, which would provide the maximum operational water requirements; secondly, by the washing formula, which would be a normal average consumption; and third, by metered water consumption over a period of time, which would indicate minimum design capacity based on present operation. The latter is usually expanded to meet proposed increase in production or plant expansion.

The temperature of the waste water discharged to the sewer, percentage of hot water as compared to total water used in the washroom, and designed fresh water temperature rise can be determined by an analysis of the washroom formula.

The dimensional information asked for would be used for locating equipment and for preparing installation drawings.

The balance of information asked for would tie in to design of the final stages of hot water heating by means of storage or instantaneous booster heater. It would also give information required for possible condensate cooling, exhaust and flash steam condensing, and boiler return system design.

You Will Be Hearing from BHC

The inroads of warm air and electric resistance heating are beginning to hurt, and the hydronics industry is organizing to fight back. The Commercial and Industrial Division of the Better Heating-Cooling Council, now being organized, may dwarf the residential division of BHC which for three years has promoted hydronic (water and steam) heating and cooling in that market.

C&I's goal: to reach and persuade in favor of hydronics each and every individual who influences the selection of a heating system in the larger buildings. The stake: to maintain and to expand hydronics' share of the growing, multi-million-dollar heating and air conditioning market.

To get the details of this new promotion, to find out what BHC intends to do in this area of vital interest to its readers, the editors of Air Conditioning, Heating and Ventilating interviewed Henry M. Gibb, chairman of the BHC Commercial and Industrial Task Force, at the Council's New York Headquarters.

" . . . the average engineer prefers hydronic systems . . "

Q. *Mr. Gibb, what influenced your group to expand into the commercial and industrial fields?*

A. Well, the thing that really influenced BHC more than anything else was the demand of member manufacturers and mechanical contractors who were interested in the heavier type of construction or in the manufacture of equipment which is used primarily for the larger type of buildings.

Initially, BHC started out as a promotional activity centered in the tremendously large home building market, that is, in the single-family dwelling field. But there are thousands of contractors and dozens of manufacturers in this country who have very little interest in the home building market. There is a distinct division between the work done by many mechanical contractors and the products made by many manufacturers, as against those contractors and manufacturers who make products and do work in homes.

Q. *Of course. Our magazine is concerned with the bigger buildings and not with the home market. Mr. Gibb, what will the C&I program, as you call it, be doing for our readers, the design engineers, consulting engineers, architectural engineers, and owners engineers?*

We intend to present them with concrete examples—with facts and figures—which we now have and which we will be continually gathering from installations all over the country, showing concretely why hydronics is the best form of heating and specifically, why it is best for commercial, institutional, and industrial buildings.

Q. *Do you feel that engineers have not kept abreast of heating developments?*

A. We feel that the average engineer *has* kept abreast of it, but we are also aware that other people are trying to sell him competing products for heating, trying to tell the engineers why they should use those types of heating. So we feel that we should do the same thing, particularly in the light of the increasing amount of electric heat activity and promotion that is going on in this country.

You know, it's a funny thing, but I think the group that is most receptive to warm air or electric heating is the school boards, and I think that this is true because school boards are composed of laymen. The local utilities in some areas have done a pretty good job in convincing the school boards.

Q. *Mr. Gibb, in connection with heating, there is a very definite line of demarcation between hydronics and warm air heating. But in cooling, where would we draw the line? If you're going to circulate chilled water to the room, that is certainly hydronic cooling. But when a central water chiller is used to cool air, which is then distributed to the rooms, that would be partly hydronic and partly air handling. Where would you draw the line?*

A. Well, the line that we could draw there is this: We realize that in certain types of structures it will be necessary that there be a circulation of air, depending on the type of system that is used. But down in the boiler room, for instance, this all can be started with hydronic types of equipment, for instance, a boiler making hot water or generating steam, a coil or a chiller.

From that point on, we realize, in certain types of structures you are going to have to use air. There are buildings that are just not adaptable to being completely heated and air conditioned with hydronics. We have no quarrel, for instance, with the steam absorption installation, which starts with a boiler. It is operated by steam but circulates air.

But, you see, the electric heating people are coming along, and they are making claims about doing away with boiler rooms, about doing away with boilers, pumps, pipes, and everything else. We don't believe it can be done. We believe there is always going to be a need for hydronics some place in the heating and cooling of buildings.

Q. *To sharpen this up—what about a heat pump?*

A. Well, there are several types of heat pump systems: air-to-air, water-to-air, water-to-water. As long as a system

has to do with a liquid or a vapor, as water or steam, we have no serious objections . . .

Q. *In other words, there you do not look upon electricity as a competitor . . .*

A. Let *me* sharpen this up a bit. When we raise objections to electric heating, we are talking about *resistance* type heating. We have no objection to an electric boiler, for instance, or to heating water or making steam with electricity.

Q. *Do you feel that electric heating is making major inroads into traditionally hydronic territory?*

A. Yes, both in homes, in agriculture, and in industry. There are already one hundred and two schools—as of three months ago—in the United States that have been totally equipped with electric heating. Just the other day, in Knoxville, Tennessee, for the first time that any of us can remember, a two-million-dollar school went to electric heat. Now, the homes down there have been using electric heating since 1946—the cable type, which is the cheapest form of electric heating.

But the schools and the larger buildings have all been heated hydronically. Now this multi-million-dollar school —the bids were awarded on the basis of electric heating. The problem that worries us is that 65% of the electric heating work is being done by electrical contractors, not mechanical contractors.

Q. *In general, what is the attitude of engineers toward hydronic heating?*

A. In most areas the average engineer prefers hydronic systems. There are certain areas close to manufacturers of large furnaces where you find rather large installations using air, also in the southern parts of the United States, where there is a demand for air systems because of the light load. They need heat primarily just in the mornings to warm up. The Southern TVA areas, incidentally, are also currently the largest areas for electric heat.

Q. *Where do the contractors fit into the promotion program? It seems to us that the manufacturer can turn to making electrical heating equipment easier than the contractor can turn to becoming an electrical contractor.*

A. Very definitely. That's a good point. The Mechanical Contractors Association of America has appointed three members of their organization to serve on the Task Force that is organizing the C&I Division. We're interested in getting everybody with a stake in hydronics to work this thing out together and so we're working with the designing people, the people who install, and the people who make the equipment.

Q. *Mr. Gibb, I gather from what you have said so far that the area in which warm air and electricity is competing with hydronic heating is primarily not in the very large buildings, but in the medium size buildings, that is, in one and two-story commercial and industrial buildings, and perhaps in buildings from four to ten stories. Is there any real challenge to hydronics in twenty or thirty-story buildings?*

A. We don't think so. Possibly one determining factor is that in your metropolitan areas, if you go into big buildings with electric heating, there would be a tremendous tax on the present facilities of the utility companies. Would the lines carry the load? We all know what happened here in New York this summer, with your electric power. So we think that the electric heating program is one which centers around the suburban areas where you have new distribution systems where a heavier load can be handled. We don't believe that large hotels or large office buildings will ever be heated in their entirety by electricity or by warm air furnaces. It just isn't practical.

Q. *What about the case of the industrial plant where they use the gas-fired radiant heater? Will you move in on that situation to sell hydronic heating?*

A. Yes, we will. We intend to. We have found that in industrial buildings that are being built today there is quite a demand for the direct-fired heater. We feel that this is an encroachment on the hydronic market. We know that there are some situations where some kinds of heating are more economical than others and we would never make the statement that in every case a hydronic system would be better than any other. But where a building is adaptable to hydronic heating we are going to try to promote hydronic heating.

Q. *Essentially, what will your approach to the engineers be?*

A. We will talk about the flexibility of a hydronic system, its low operating cost, long life, the comfort conditions attainable, the ease of installation, and what we might say is the niceties of a hydronic installation. As you know, there are just thousands of products that are made today for schools and other types of buildings —unit ventilators, for instance—just beautiful pieces of equipment—and we feel that that type of equipment enhances the looks and the value of any building, and we know that a properly installed hydronic system needs very little maintenance. Also, the contractor's know-how is established.

Q. *What will be the relationship between the C&I Division and BHC?*

A. Here's the way the thing works: I am the sales manager of Pacific Steel Boiler Division of National-U.S. Radiator Company, so let's use National-U.S. as an example. There is also our Cyclotherm, and the Heating and Air Conditioning Divisions. Now, Pacific and Cyclotherm are concerned primarily with products for commercial and industrial application. The Heating and Air Conditioning Division is concerned primarily with products for the home field but it also has an interest in the commercial and industrial field. Our allocation of money to BHC is so much a year, x number of dollars. From this point on, a part of the company's assessment will go to the commercial and industrial program, and another part of it will be assigned to the other side of the BHC operation—to the residential side. There are some companies who manufacture products primarily for commercial and industrial application only. Now if they choose to do so, their allocation of funds will be transferred over the C&I division.

We are enrolling into membership new manufacturers and mechanical contractors who, heretofore have had no interest in BHC because it dealt primarily with homes. I feel, as a result of new members, that eventually the allocation of funds to the commercial and industrial program will be larger than for the home program. The dollar volume of the commercial and industrial type building, because of the cost of equipment used, is so much greater.

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

School Shower Facilities

ADEQUATE shower facilities are an important part of every new school being erected for physical training is considered a vital part of school activities and showering after vigorous exercise fosters cleanliness. Adequate shower facilities for both boys and girls are therefore a definite requirement. This raises the question of how many showers should be provided. Many factors including the number of students, and the time allotted for the showers all must be considered. The local plumbing code, the architect or the engineer will usually specify the required number of showers.

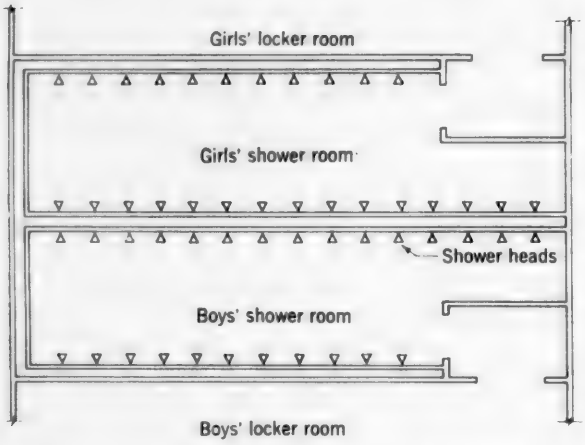


Fig. 1. Arrangement of shower rooms in a school.

Shower Room Layout

The architect is responsible for arranging the type of shower rooms he favors to fit the particular building design. As an example, a typical shower room is shown in Fig. 1.

In this layout are back-to-back shower rooms for boys and girls. This arrangement permits a certain amount of piping economy. The back-to-back showers are served by a common supply of hot and cold water. Each shower room contains approximately 26 shower heads.

These shower rooms are also used by competing football, basketball, and baseball teams. When boys teams compete, the girls' shower room is used by the opposing team, the reverse holds when girls teams play.

Types of Showers

Many types of showers may be utilized in the school. It is usually the engineer's responsibility to select the type best suited for the special needs. Several types of popular shower arrangements are shown in Fig. 2, and are described as follows:

Regular Type. This arrangement permits both hot and cold water to be dispensed by individual valve controls. The bather will regulate the water to any temperature he desires. For this arrangement it is advisable to furnish only tempered water to the hot water valve. This prevents any possibility of scalding.

Mixing Valve. This arrangement is very popular because the bather need operate only one handle. The hot water supplied to this valve should also be tempered to avoid the possibility of scalding. A further precautionary feature is that the valve opens to dispense cold water first before the hot water flows. Many varieties of this mixing valve arrangement are on the market.

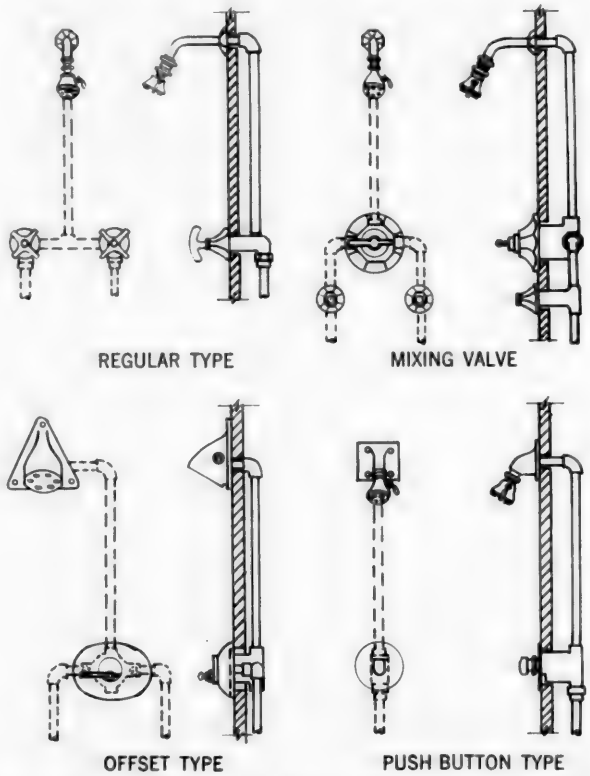
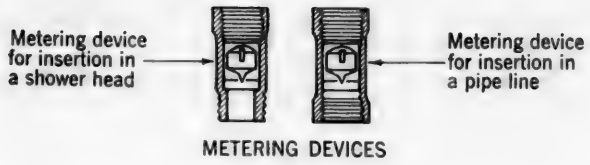
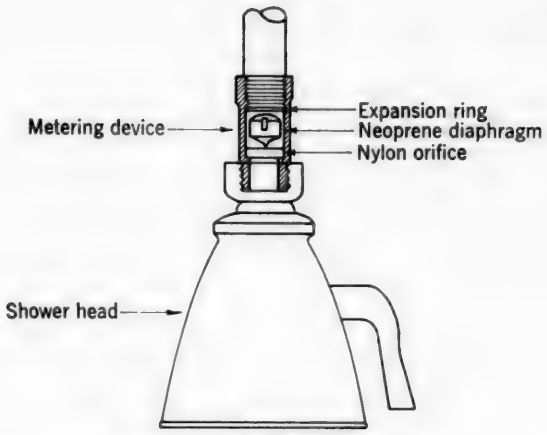


Fig. 2. Several types of shower arrangements that are commonly used.



METERING DEVICES



APPLICATION OF METERING DEVICE WITH SHOWER HEAD

Fig. 3. Metering devices that may be used to conserve hot water.

Offset Type. Sometimes it is desirable to have a mixing valve offset away from the spray of the shower. When this feature is favored, the offset shower arrangement can be used. Here again, it is important that tempered water be supplied to the mixing valve.

Push Button Type. In some instances, a push button type of shower arrangement is sought. This arrangement provides water at a preregulated temperature. When the button is depressed, it will dispense water for some part of a minute dependent upon its particular setting. The water temperature is regulated by a remotely located mixing valve.

Other arrangements, in addition to those shown, may be used. Also available are various types of shower heads, only three are illustrated in Fig. 2.

Water Conservation

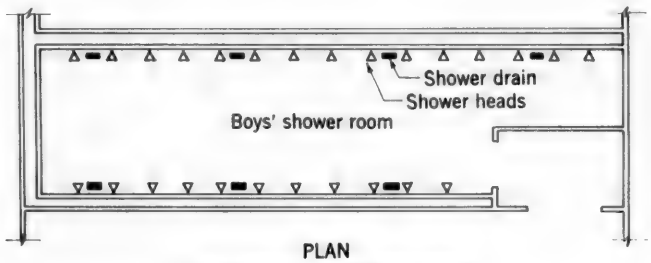
A shower dispenses quantities of water ranging from 5 to 9 gpm or more. In addition to this being a very wasteful situation, it also places a tremendous burden on the hot water generating plant. In an effort to overcome this condition, several manufacturers have now placed on the market, metering devices that regulate the quantity of water that can be dispensed from a shower head. These metering devices permit only a given quantity of water to flow, depending on the construction and adjustment of the device.

An example of this type of device, which may be inserted in a shower head or in a pipe line, is shown in Fig. 3. Illustrated, is the application of the metering device in a shower head. These devices can be furnished to regulate a flow of water from $2\frac{1}{2}$ to $4\frac{1}{2}$ gpm, depending upon the particular type and make of unit.

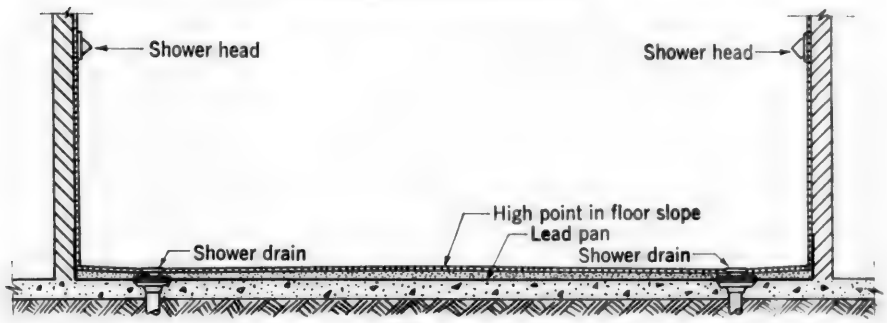
Units shown are for example only for many manufactured types are available. The use of such devices is highly recommended to conserve the water supply. Equally important, this device affords the same generous supply of water that is needed for adequate showering as does the large capacity shower heads. However, the spray is not the wasteful volume dispensed by the larger units.

Drainage

Proper drainage, an important consideration in a shower room, must be so arranged that it will quickly remove the soapy water that is splashed on the floor surface. Refer to Fig. 4, and note some of the factors that must be given due consideration with regard to drainage facilities.



PLAN
An arrangement of shower drains



ELEVATION
Typical installation of shower drains

Fig. 4. Locations and typical installation of shower drains.

In the plan of Fig. 4 a drain is located beyond every fourth shower head and the drains are placed as close to the wall as possible. This method assures the proper removal of water.

If possible, the center of the drain should be located between 12 and 18 inches from the wall. The floor should be sloped in the direction of the drain with a high point in the center of the room and a high point at the wall.

With the drain located close to the wall, the soapy water will drain toward the wall and away from the bather, thereby, greatly reducing a hazard that would otherwise exist when soapy water must drain toward the center of the room.

A lead pan, properly installed, should be used when it is desired to make the floor slab watertight. Copper or membrane material may also be utilized. The material used should be turned up in the walls to provide a positive means of waterproofing.

Types of Drains

Many types of drains are available for shower rooms. A few such as the round top, square top and rectangular top drains are shown in Fig. 5. Although these are the types most generally used, there are nevertheless numerous other types which may be used for shower installations with equal success.

The drains are equipped with a clamping collar to permit securing to the lead, copper or membrane pan when it is used. Openings in the top of the drain should be small enough in size to prevent rings or other objects from passing through the openings. Moreover, the small openings offer less hazard to the toes of the bather than do the drains with larger openings.

Frequently, a depression or recess is placed in the floor slab to facilitate drainage. The drains are placed in this depression. This provision has certain advantages which are offset by the fact that the depression presents a potential hazard to the bather.

A rectangular top drain is quite popular because it features a large effective drainage area so that if a washrag is dropped it will not block the drainage capacity of the drain.

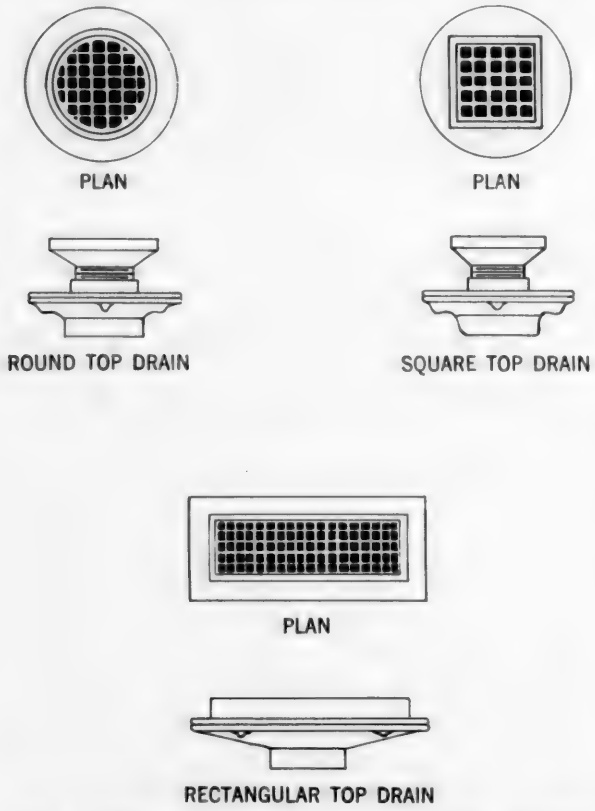


Fig. 5. Several types of shower drains for use in shower rooms.

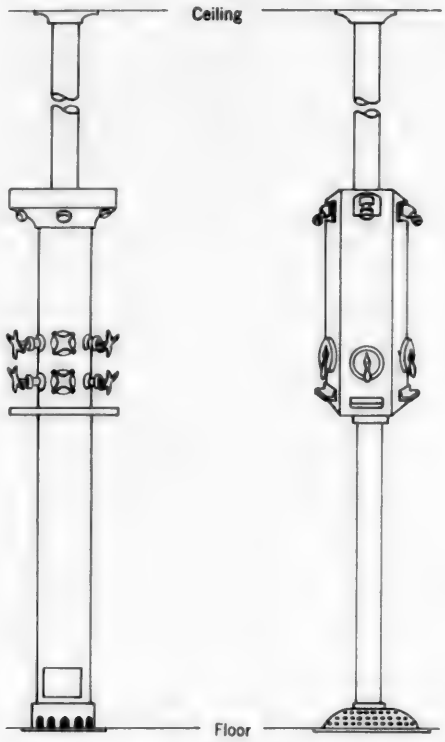


Fig. 6. Two types of column showers that may be used in shower rooms.

Column Showers

A type of shower that is becoming increasingly popular is the column shower. Two types are shown in Fig. 6. One type is round with 2 or 5 heads while the other has 2 to 5 sides for showering, The units are generally fabricated of stainless steel and include valves, shower heads and a drain. Soap dish holders are also included.

Water is supplied to the column shower either from the floor or ceiling. In both cases the water piping is concealed by the unit and finished tubing which extends to the ceiling. Each manufacturer has special provisions that take care of the water piping, venting waste and trapping. It is suggested that the manufacturer of the particular unit favored be consulted with regard to their recommendations.

In any event, these units offer a neat and efficient manner of shower dispensing equipment.

Arrangement of Column Showers

To illustrate how column showers can be used, the

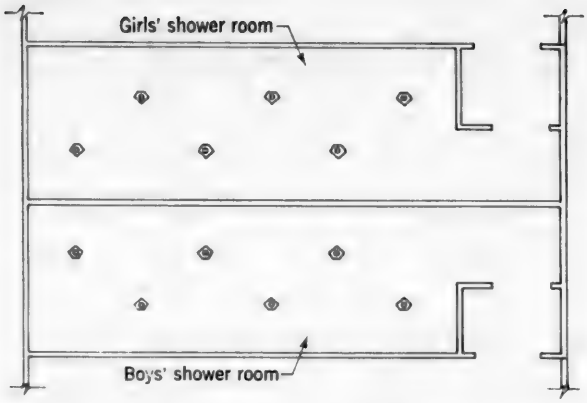


Fig. 7. How column showers may be placed in shower rooms.

same basic shower room shown in Fig. 1, has been shown to indicate the arrangement of the column showers. This arrangement is offered in Fig. 7.

In this instance, the pipe spaces have been omitted since the water is supplied from either the ceiling or the floor. Figure 1, featured 26 shower heads each for the boys' and girls' shower rooms. With the column shower, 6 units are required in each room and offer 30 shower heads in each of the rooms. The 5 sided column shower was used for example to portray the arrangement. The round column shower can of course, also be used.

Ample room is available around the showers for the bathers. Caution must be exercised to provide tempered water to the shower valves and thus avoid scalding.

Column Showers With Partitions

Quite often it is desired to provide showers with partitions for the girls' shower room. Many arrangements may be utilized for this purpose ranging from the individual partition along the wall to the circular partition. As example of the circular shower with partitions is illustrated in Fig. 8.

The regular circular shower is installed on the shower room floor and the drain in the base offers drainage. Here again, the water, waste and vent facilities are supplied either from the ceiling or floor or a combination of both. Shower curtains offer the bathers the degree of privacy desired.

The circular shower with receptor features a self contained drainage unit and is ideal for locations where it is not desired to render the floor watertight. Here again, shower curtains permit the privacy desired.

In addition to these, there are other types of showers for particular layouts.

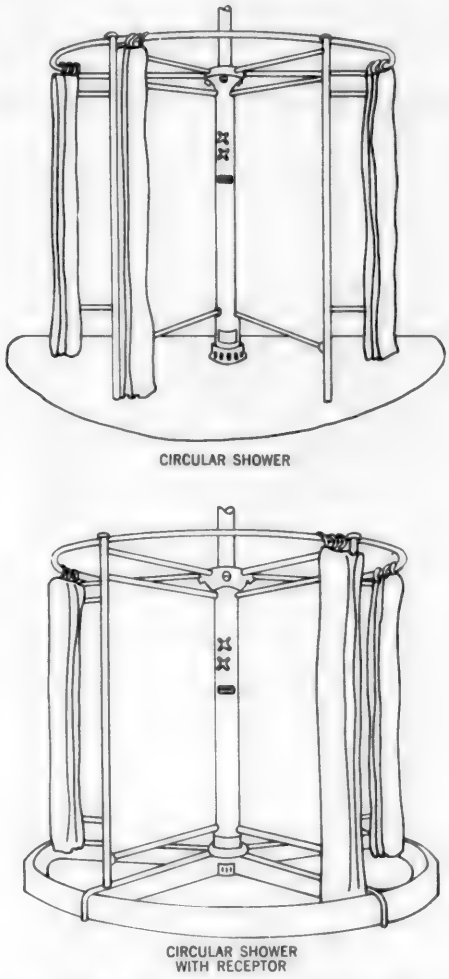


Fig. 8. Two types of circular showers.

Next month's article will discuss the means for generating hot water for the school shower rooms. Types of equipment and the factors that must be considered will be covered.

Speakers Announced for ARI Conference Session

Names of four speakers who will appear at the ARI Conference Session scheduled at Atlantic City, N. J., on November 3, as a special feature of the 11th Exposition of the Air-Conditioning and Refrigeration Industry, were announced by R. H. Luscombe, chairman of the 11th Exposition Committee.

They are: President Harold J. Humphrey, of the National Association of Frozen Food Packers, whose presentation will cover the vital necessity for refrigeration equipment in today's food distribution scheme, the need for proper equipment in all phases of food marketing, from production and storage through retailing and into home equipment, and assurance to the manufacturers, many of whom will be displaying equipment at the 11th Exposition, of the food industry's desire to cooperate in letting them know what is needed; and Arthur S. Goldman, market research director of *House & Home* magazine, whose field of discussion will be the market for residential air-conditioning, and suggestions as to how this market may be developed by the industry.

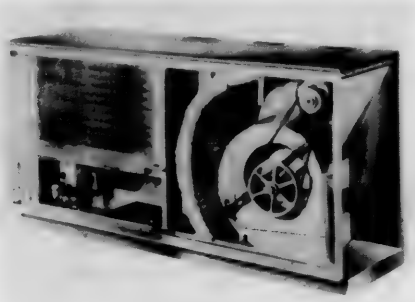
Also, Joseph Rorick, assistant for planning and construction, International Business Machines Corp., who will speak as the representative of a large industrial user of air-conditioning; and H. E. Ziel, an associate of Albert Kahn Associated Architects and Engineers, Inc., of Detroit, who will speak on the industrial approach.

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing additional information about new equipment and materials described in this department.

Classroom Heating System Expanded

Lennox Industries, Inc., Des Moines, Iowa, announces a development in its line of classroom heating, ventilating and air conditioning equipment. New air processing units with steam or hot water coils permit use of the company's



Comfort Curtain system with a central steam or hot water heat source. Available in three colors with matching vinyl tops, these units are known as the DVS2-1200, for use with steam, and the DVW2-1200, for use with hot water. Units are built of 16-gage steel, and are completely factory wired and assembled for quick easy on-the-job installation.

For maximum efficiency, air is drawn through the aluminum and copper coils which are located upstream from the outside ventilation air to prevent freeze-up during cold weather.

More information? Circle Item 1, postcard, last page.

Continuous Line Diffusing Grille

Barber-Colman Co., Rockford, Ill., has added a continuous line diffusing grille, Model STWA, to its Uni-Flo line of air distribution products. The model is designed to maintain the functional straight-line beauty of modern architecture. It is particularly effective when installed in continuous runs adjacent to large exterior glass sur-

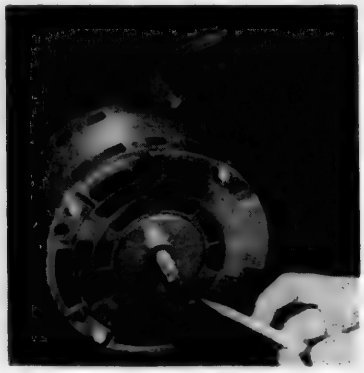
faces, and can be mounted in ceiling, floor, sill or side wall. When installed in continuous runs, individual sections butt neatly together without any noticeable breaks.

This grille, featuring a sturdy aluminum, flat flange, incorporates an adjustable core which permits adjustment of the air pattern through a simple, tamperproof setting of the fins. The model is normally furnished with a 5-degree deflected vertical air pattern which can be altered up or down by inverting the grille. It can also be supplied with a 15-degree vertical deflection for special applications.

More information? Circle Item 2, postcard, last page.

New Motor for Air Moving

A new 48-frame fractional horsepower motor, designed primarily for the heating and air conditioning industries, is announced by Westinghouse Electric Corp., Pittsburgh, Pa. Length of the motor is up to one-half inch shorter than the previous design to match recent trends toward greater compactness.



The new designs are for shaded-pole motors up to ¼ hp and permanent-split capacitor motors up to ⅓ hp. Using Permawick material, the motors will, under normal conditions, operate for a minimum of 5 years without lubrication. Permawick, a combination of oil and cellulose fibers, is inserted in motor end shields like grease.

Motors are available either with line leads or a terminal board mounted over the vent holes in the frame. Board is equipped with spade connectors.

More information? Circle Item 3, postcard, last page.

Single-Seat Temperature Regulator

Lawler Automatic Controls, Inc., Mount Vernon, N. Y., announces a balanced, single-seated temperature regulator. The balanced single seat is particularly recommended for applications requiring a self-contained dead-end shut-off temperature regulator.

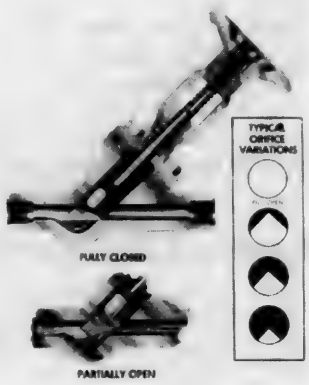
The term "balanced single seat" is derived from the fact that the line pressure on the main valve is balanced through a small pilot valve which, when opened, allows the main valve to be lifted from its seat. This valve type will provide very good dead-end service because it utilizes the full line pressure to hold the main valve shut.

The new valve is a tight-closing modulating valve suitable for steam pressure up to 150 psi, and available in sizes from ½ through 2 inches in bronze body with union ends.

More information? Circle Item 4, postcard, last page.

Unrestricted-Flow Valve

A control valve, in which the flow moves in a direct and unrestricted straight line through the valve at all throttling positions, is announced by General-American Valve Co., Corona del Mar, Calif.



Called the Straight-Flow, its construction is said to greatly reduce pressure drop and friction loss while giving infinitely variable throttling. Its k factor is only 0.35.

Principal advantages of the valve are said to be its ability to pass more fluid or gas for a given pressure and with less turbulence, and its resistance to clogging. According to the manufacturer, stem is fully stabilized at all throttling positions, eliminating tip vibration completely.

Flow regulation is accomplished by raising or lowering the stem, which is placed at an angle to the flow. The stem does not rotate, but moves up or down in an angle. As stem rises, a larger section of the V-groove, milled in the stem tip, is presented as flow area. Orifice opening is indicated on calibration plate.

Valves are made in carbon steel, stainless steel, and bronze in pressure ratings from 600 to 10,000 psi from ⅛ to 4-inch sizes. Automatic control is available.

More information? Circle Item 5, postcard, last page.

All-Weather Fuel Use Computer

A low-cost analog computer that automatically indicates average fuel oil consumption continuously—under all weather conditions—and relays the information to an easy-to-read control panel is introduced by HRB-Singer, Inc., subsidiary of The Singer Manufacturing Co., New Brunswick, N. J.

Called the Fuel Use Computer, the device was developed for fuel oil dealers to provide a precise, up-to-the-minute means of determining the amount of fuel oil

their customers are consuming. Installed in a dealer's plant or office, the unit employs a measuring principle that is reportedly more accurate than the "degree day" system now in use.

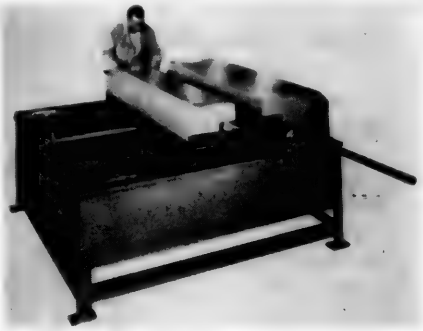
Key components of the computer are a cylinder shaped analog roof-top unit (left) and a recording console the size of a portable typewriter (right). Instruments inside the roof unit create an electrical equivalent, or analog condition, of heated buildings exposed to weather. As weather changes from hot to cold, from sunshiny to cloudy, the analog unit adjusts its energy output to meet these changes. As it does, the change is relayed electrically into the recording console where it is measured in digital readings called "weather units."

One of the outstanding features of the new computer is the continuous, year-round accounting for fuel consumed in making hot water as well as heat. Three digital registers on the console indicate the amount in weather units. The first is for installations with low hot water requirements; the second, for average requirements; the third, for high. A fourth register indicates fuel use for heating only.

More information? Circle Item 6, postcard, last page.

Rolls Both Sides in One Pass

A ten-station, duplex type roll forming machine, added to the metalworking machinery line of The Lockformer Co., Chicago, Ill., is designed for medium and high production metal fabricating plants. Time savings of over 50% can be realized by forming both sides of a sheet in one pass through the machine, the company states.



This machine was built to meet the specific needs of a Midwestern manufacturer of pre-fabricated round and square pipe used in heating and air conditioning installations. It can now be supplied to order for simultaneously fabricating two shapes or locks in a sheet for such other applications as spray booths, partitions, building panels and roofing manufacture.

The basic machine consists of two 10-station units with 24-gage capacities (but heavier-gage units can also be supplied). One unit is stationary. The other is movable to accommodate various sheet widths, from 10 to 40 inches. Forming speeds up to 120 fpm can be attained.

A single 10-hp motor powers the twin roll formers through coupled drive shafts. The machine is equipped with heavy duty production bearings and central station lubricating points. It is supported on a heavy duty base.

More information? Circle Item 7, postcard, last page.

Refrigerator-Water Cooler

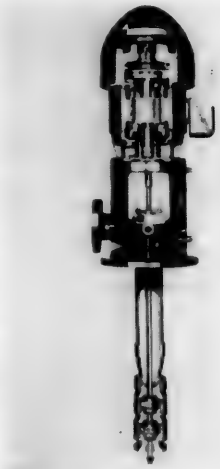
Cool-R-Frig, a combination home-style refrigerator and water cooler that serves both cold drinking water and 185 deg F hot water, is available in a pressure model from Sunroc Division CF, Glen Riddle, Pa. It features all the conveniences of the popular bottle type model that has been used in stores, and for numerous commercial and industrial requirements.

According to the manufacturer, the refrigerator safely stores a large supply of foods, beverages, and other perishables at a controlled temperature of 42 deg. It also incorporates a freezing compartment with two aluminum ice cube trays, and makes ice four to five times daily, as required. The interior design features all rounded corners for maximum sanitation and easy cleaning.

More information? Circle Item 8, postcard, last page.

Vertical Turbine Pumps

Vertical, short-coupled turbine units, simply designed for cooling towers, circulating or process pumping, lake and river intakes, boosters, fire pumps, etc., are offered in forty sizes by Allis-Chalmers Mfg. Co., Milwaukee, Wis. The new pump line is available in ratings of 20 to 8,000 gpm at heads to 400 ft and over, depending on the number of stages.



A considerable space saving, the company states, is accomplished through integral construction of motor support and discharge head which reduces base requirements. Because its pumping element is usually submerged, the pump seldom needs priming. Its discharge column can be varied for changing requirements and its head and motor can be located above highwater to avoid flooding and motor damage.

The pump is economical to install since one small foundation supports the motor and discharge nozzle. There is no large bed plate to be grouted nor is suction piping required.

Available with Allis-Chalmers hollow-shaft a-c motors, pump has no open coupling, needs no special interlock controls or foot valves for priming, and its dynamically balanced impellers are said to assure quiet operation. Special stress design for short coupled heads permits a weight reduction. Water lubricated bearings are said to be virtually trouble-free.

Easy to maintain, the vertical short-coupled turbine pump makes it possible for users to increase pumping capacity without greatly boosting space requirements.

More information? Circle Item 9, postcard, last page.

Pipeline X-Ray Inspector

X-Ray inspection of pipeline section and window welds is said to be more easily accomplished with the use of a new lightweight, portable x-ray apparatus, the LX-140, manufactured by X-Ray Dept., General Electric Co., Milwaukee, Wis.

The unit shown in the accompanying illustration is being used on a municipal central steam pipeline job. In this setup, the window welds being inspected were located at a pipeline vertical offset which brought the pipe to within only a few feet of the surface. City block-long distances of pipe were installed at depths varying from a few feet to 10 ft below the street surface. Use of high voltage portable x-ray equipment makes inspection of these weldments possible in places where larger, bulkier x-ray equipment would be impractical.

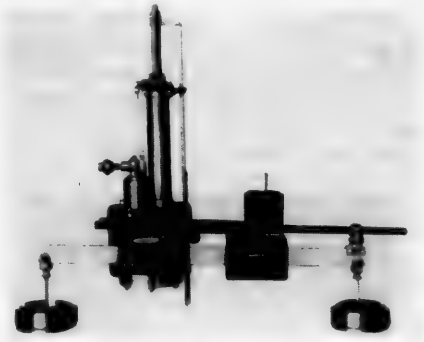
The unit shown weighs 46¼ lb. The control unit weighs 25 lb. and both ship in a shockproof case which measures 26 x 24 x 18 inches.

Simplified controls enable the most inexperienced personnel to learn its operation in just a few minutes of instruction, the company states. A continuous range of 70 to 140 kvp is available. Radiographs with 2% sensitivity and 1.5 density can be produced with 1½ minute exposure through 1¼ inches of steel. The new unit will operate in temperatures ranging from 0 to 120 deg F, humidity up to 95%, and altitudes up to 5000 ft with ample effective radiation protection provided.

More information? Circle Item 10, postcard, last page.

Hydraulic Damper Regulator

No. 5000 hydraulic damper regulator, which also regulates fans, stokers, oil and gas control valves and is suitable for use on any boiler that operates at pressures from 5 to 150 psi, is available from Atlas Valve Co., Newark, N. J. The device may be used to actuate lever-operated balanced valves for pressure regulating service, either reducing or unloading.



Regulator repositions dampers and lever-operated valves in response to small changes in the controlled pressure. Adjustment of the controlled pressure is made by adding weights or removing them from the lever of the regulator. Minute changes are accomplished by repositioning the sliding weights.

The regulator, which continuously maintains the desired boiler pressure within narrow limits by automatically adjusting boiler draft, moves the damper on pressure changes of as little as ¼ lb. It is equipped with a compensating device said to provide increased fuel economy and boiler efficiency. Actuated by city water pressure with very small water consumption, the regulator is easily changed from direct to reverse acting.

More information? Circle Item 11, postcard, last page.

Ultrasonic Dishwasher

Substantial cost savings by hotels, restaurants, and institutional feeding operations are claimed for its ultrasonic dishwashing equipment by The Narda Ultrasonics Corp., Westbury, L. I. Equipment was jointly designed by Narda and Stanley Equipment Co., Brooklyn, N. Y.

Using ultra-high frequency sound waves, equipment leaves dishes, silver and glasses sparkling clean in seconds, according to the company. The "Nike," said to be the first ultrasonic dishwasher for the mass-feeding industry, is designed for installation in institutional and public kitchens. It can be plugged into any standard electrical outlet and hooked up to normal plumbing. The machine used ordinary dishwashing detergent and tap water.

Cleaning speeds and capacity of the ultrasonic dishwasher are much greater than conventional sinks or automatic dishwashers, allowing the restaurant operator to save premium-value floor space and high labor costs.

A Narda Sonblaster G-10001 ultrasonic generator provides 1 kw power at 40,000 cycles per second to the ultrasonic sink. The stainless steel ultrasonic tank has a capacity of 35 gal, measuring 20 by 20 by 20 inches deep, and is flush mounted in a stainless steel drainboard.

Other units are in the design stage for hotel, restaurant and institutional trade for behind-counter glass cleaning, flatware and holloware cleaning and other special kitchen requirements.

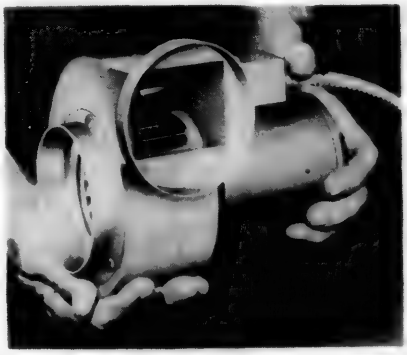
With ultrasonic dishwashing, there is no longer any need for hand scrubbing of dishes to remove stubbornly-clinging food particles, the manufacturer states. Fried egg, hardened sugar and coffee residues in the bottom of the cup, even lipstick traces, will slide off in a few seconds. The ability of ultrasonic agitation to remove food and other foreign matter stuck to dishes and cutlery and leave them sparkling clean is due to the cavitation action of high frequency sound waves. These waves, at 40,000 cycles per second, far above the human hearing range, alternately compress and decompress the water in the sink. This action causes myriads of minute vacuum bubbles to form and collapse with great force, which blasts off all traces of contamination from the items being washed.

More information? Circle Item 12, postcard, last page

Motorized Vent Exhauster

A motorized vent exhauster, developed by Reznor Manufacturing Co., Mercer, Pa., opens the way for the economy and flexibility of gas unit heating in office buildings, older manufacturing plants, and multiple-story warehouses.

The device, called the Venter, vents exhaust gases from unit heaters directly to the outdoors through the side wall of the building. It requires only a short length of standard, lightweight 4-inch pipe. Lack of a chimney is no longer a problem.



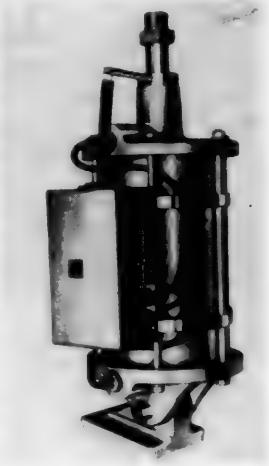
It is also seen as extending the use of floor model, direct-fired heaters in the home for, again, unsightly chimneys are no longer necessary. In residential applications, the Venter exhaust is taken through a hole in the floor, and then carried out under the floor to the outside.

The vent exhauster is half the size and price of similar capacity units, the company reports. Powered by a permanently lubricated, fan-cooled electric motor, it is thermostat-controlled. Model V300 is used with heaters from 25,000 up to 300,000 Btu input.

More information? Circle Item 13, postcard, last page.

Compact Pneumatic Motor

Type LC (large capacity) piston type motor, 75% smaller than the double diaphragm motor it replaces, is announced by The Powers Regulator Co., Skokie, Ill.



The compact pneumatic unit has a cylinder volume of only 126 cubic inches, yet provides 150 ft-lb of torque and a 7-inch stroke. It can be mounted in any position to control vortex dampers, inlet vanes of refrigeration compressors, and large dampers.

Torque rating of 150 ft-lb is based on 20 psi air supply, a crank radius of 5 inches, and 90° travel. Motor can gradually control 200 sq ft of damper area up to 1200 fpm velocity.

A ½ psi response is provided at the standard range of 10 psi. By adjusting the positioning relay, the range spring can be set to as little as 3 psi, and as much as 22 psi, for full travel of shaft.

More information? Circle Item 14, postcard, last page.

Four-Way Valves

Four-way valves, Series 4W, manufactured by Alco Valve Co., St. Louis, Mo., have cast iron slides and steel outer shell.

Fine machining and precision honing, the company states, make it unnecessary to use plastics for sealing or tight seating. Thus, possible heat damage to seating poppets, when the valve is brazed into the refrigeration system, is eliminated. Life tests in independent laboratories are said to have exceeded 300,000 cycles without failure to shift and without loss of the tight seating.

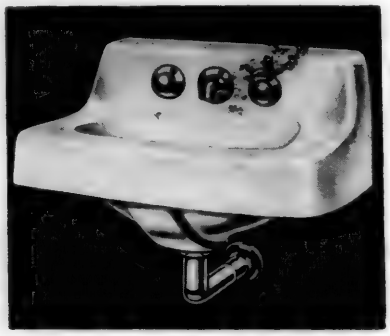
Design of the valve is such that it will shift while the system is in operation with a 300-psi differential. The rapid shifting shortens changeover time, and thus shortens the defrost cycle. Shifting of this valve is independent of any pressure drops in the valve, and assures positive shifting under any combination of operating conditions.

Valve contains a carefully balanced dashpot action to prevent mechanical hammering during shifting. Also, the valve is so constructed that it may be mounted in any position except with the pilot valve upside-down. it can be installed to shift to cooling or to heating on power failure for the fail safe position.

More information? Circle Item 15, postcard, last page.

Prison Lavatory

A prison lavatory, featuring modern, compact styling and maximum durability, is announced by American-Standard Plumbing & Heating Division, New York, N. Y. Fixture, called the Prismere, has been especially designed to accommodate small-space areas in modernization or new installations.



The lavatory's styling gives a spacions appearance to its compact size—16 x 14 inches. Designed to withstand harsh treatment, the unit is made of durable cast iron coated with acid-resisting enamel, and is equipped with self-closing push-button supply fittings.

Fixture also includes a convenient back shelf, tapered bowl, front overflow, and an integral soap depression in the shelf area. It is available in white only.

More information? Circle Item 16, postcard, last page.

Universal Adjustable Pipe Hanger

New units in its Auto-Grip universal adjustable pipe hanger ring line, for pipe sizes from 4 to 8 inches inclusive, are announced by "Automatic" Sprinkler Corporation of America, Youngstown, Ohio. The line now covers pipe sizes from ½ through 8 inches. Design permits use of this single type of hanger in most applications in place of a variety of other types of hanger rings. Thus it reduces inventory investment, storage space, and purchasing costs, the company reports.

The universal design for large pipe size consists of a hinged metal band and a captive locking insert for attachment to a threaded hanger rod. The captive insert means there is no loose component to be lost or forgotten. Attachment is a fast, simple procedure involving squeezing the ring to release one end of the band from the insert, opening the band, slipping it over the pipe, and relocking the end of the band to the insert. No tools are required. The insert is self-locking by spring action reinforced by the weight of the pipe.

More information? Circle Item 17, postcard, last page.

Line of Aluminum Fittings

A complete line of aluminum fittings for Schedules 10 and 40 pipe is announced by Speedline Div., Horace T. Potts Co., Philadelphia, Pa. Alloys include 3003F, 6061-T6, and 6063-T6.

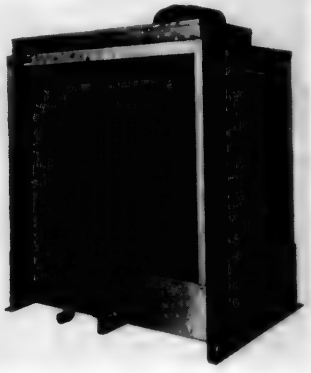
The line of fittings incorporates the extra-length feature familiar to users of Speedline stainless steel fittings. The extra length gives more clearance for welding, simplifies alignment, allows for flanging without welding, and permits a multiple choice of joint at every connection.

Joints may be butt welded or socket welded with aligning connectors. Either serrated flanges or unions may be used where demountable joints are required. Serrations on the I.D. of both the union ferrule and the flange allow either pipe or fitting to be expanded directly into the union or flange, insuring a tight leak-proof joint without welding. Other fittings include tees, crosses, 45 and 90-degree elbows, caps, eccentric and concentric reducers, and stub ends.

More information? Circle Item 18, postcard, last page.

More Cooling in Less Tower Space

A new outdoor-type cooling tower is announced by Acme Industries, Inc., Jackson, Mich. The tower, designated Model AST Econ-O-Mizer, offers more cooling capacity in less space than any conventional tower, the company states. Floor area and overall space requirements have been reduced by as much as 50%. Weight has been reduced a comparable amount. Rotting and fungus growth have been eliminated. Because of its design, the



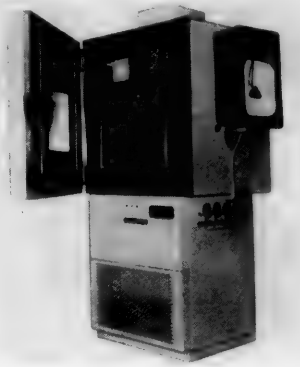
tower can be disassembled and reassembled quickly and easily on the site, and the deck can be removed for cleaning and maintenance in a matter of minutes.

The heart of the tower is its plastic deck. It consists of a series of high-impact polystyrene drip trays which are fastened into easy-to-handle "building blocks". These blocks are simply stacked in the housing. Each plastic drip tray has more than 600 individual, controlled drip spouts. The trays are staggered so that the water passes slowly downward from one tray to the next in a precise pattern. Close control of the drip pattern and air flow, which is not possible in the conventional outdoor tower, makes it possible to assure maximum contact between air and water, with resultant high capacity and small size. Since the plastic deck cannot warp, the drip pattern remains constant for the life of the tower and capacity will not vary over a period of time, according to the firm.

More information? Circle Item 19, postcard, last page.

Smaller Environmental Chamber

A smaller-space controllable-temperature environmental chamber with characteristics usually reserved for bigger models has been added to the standard line of Tenney Engineering, Inc., Union, N. J., manufacturer of climate



simulation equipment and heating and air conditioning components.

The new unit is the Tenney-3, a three-cubic foot, front opening, upright chamber to which relatively humidity control can be added at the buyer's option. Heretofore the 10-cubic foot Tenney-10 was the smallest standard line model available with the humidity option.

Standard features of the Tenney-3 include: Temperatures down to −40, −100 or −120 deg F, and up to +240 or +350 deg; pull-down rate is one hour from ambient to −100 deg; heat-up is 70 minutes from ambient to +350 deg; and single electrical connection for easy installation.

Options include: A temperature low of −120 deg and a high of +500 deg; and relative humidity of 20% to 90% in the dry bulb range of 35 to 185 deg, limited by a 35-deg dew point, 5% at 160 deg.

More information? Circle Item 20, postcard, last page.

Glass Fiber Duct Liner

Ultralite, glass fiber duct liner, manufactured by Gustin-Bacon Manufacturing Co., Kansas City, Mo., is now available at no extra cost with a newly developed and approved fire resistant coating. The new product carries a flame spread classification of less than 25, and complies with all the requirements of the National Board of Fire Underwriters' Bulletin No. 90-A and B, and the strictest fire codes everywhere.

This duct liner carries an Underwriters' Laboratories label. It is the only liner, the company reports, that is permanently stamped with density and flame spread classification.

More information? Circle Item 21, postcard, last page.

Air Conditioning Starter

Two contactors and starters for control of air conditioning compressor motors from 7½ through 20 hp have been announced by General Electric Co., Schenectady, N. Y. Both are rated at 50 and 60 amps, 110/220 volts, or at 25 and 30 amps, 440/550 volts.

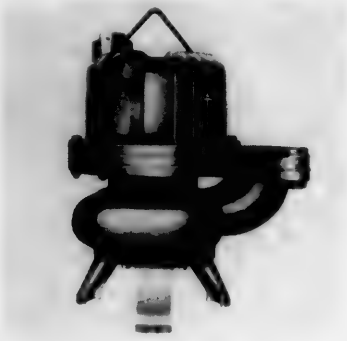
The forms can be furnished with two or three poles, and either can be ordered with one auxiliary contact. Starters can be obtained with quick-trip overload relays for protection of hermetically sealed motors. Open or NEMA Type 1 enclosures can be used.

According to company engineers, the new starters are also available with conventional overload relays for use on air conditioning loads. The contactor can be used also for a-c non-inductive heating applications.

More information? Circle Item 22, postcard, last page.

Non-Clog Sewage and Sump Pump

A submersible, non-clog sewage and sump pump, called the Immersipump, is announced by Chicago Pump Co., Chicago, Ill. It features low original cost, low maintenance cost, ease of installation, ease of servicing, and long, trouble-free life.



Motor is specially designed for submersible operation, being totally enclosed and oil-filled to ensure against water entering the unit. No superstructures are required for outdoor installations; minimum headroom is required for indoor installations.

Pump is available with a Sealtrode sealed electrode floatless pump controller.

More information? Circle Item 23, postcard, last page.

High Temperature Tube

Chase Brass & Copper Co., Waterbury, Conn., announces that a special processing of 70/30 cupro-nickel tube which the company employs makes this tube highly suitable for high-temperature feed water heaters and other heat exchanger applications.

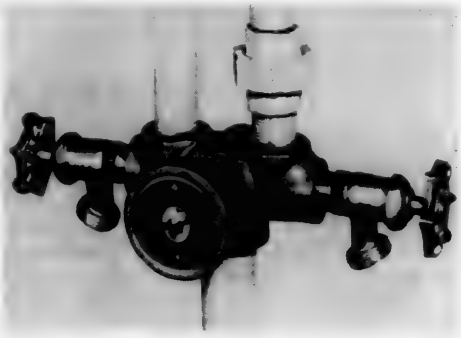
This processing, the company states, provides a precise balance between the necessary strength and the necessary ductility to allow fabrication of the tube into U-bends. The tube will be especially useful in power generating stations and heating plants where high pressures and temperatures requires both high strength and ductility. Tube is 1-inch OD with 0.049-inch wall and provides a minumum of 72,000 psi tensile strength and 15% elongation. It is furnished in straight lengths or U-bends.

More information? Circle Item 24, postcard, last page.

Balancing-Purging Valve

A valve for two-circuit water systems, developed by Bell & Gossett Co., Morton Grove, Ill., is said to be the first of its kind capable of performing both the important functions of balancing and purging.

Called the Duo-Flo balancing and purging valve, the unit performs extremely accurate balancing by a simple adjustment which diverts water into one circuit, while simultaneously decreasing the flow through the other



circuit. It is illustrated installed in a two-circuit water system.

Positive purging of each circuit is attained by a turn of the valve's handle, which closes one circuit. When the drain valve on that circuit is opened, trapped air is forced out. The other circuit is then purged in the same manner.

Purging the system with the valve takes only a few minutes, the company states, thus reducing start-up costs and allowing the contractor to start the system in minimum time and with all trapped piping air eliminated. According to the manufacturer, the valve is easy to install, improves the appearance of the system, and saves plumbing time and material. A single unit takes the place of three tees, one ell, five nipples, and two gate valves.

More information? Circle Item 25, postcard, last page.

Four-Pass Heat Exchangers

Requiring only one-half the water flow that a two-pass exchanger of the same diameter requires to maintain the same velocity, a complete line of four-pass heat exchangers is now available from Young Radiator Co., Racine, Wis.

The new four-pass models include the F-300, F-500 and F-600 series. The F-200 series remains available only in one pass, while the F-800 series will continue to be available in four-pass design.

More information? Circle Item 26, postcard, last page.

(Continued on page 112)

BEFORE YOU BUY, THINK:

Do you need 6, 7, 8 or 10 fins per inch?

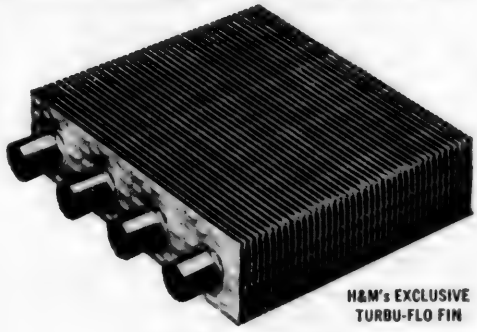
Halstead & Mitchell supplies Turbu-Flo Coils with the fin spacing you want

Why accept someone else's "standard" when your own judgment dictates another fin spacing for the specific job at hand. Now you can call on Halstead & Mitchell for Turbu-Flo coils with 6, 7, 8 or 10 fins per inch to meet your individual size requirements.

H&M makes coils for use with most refrigerants, steam (standard or non-freeze coils), hot or chilled water. All coils are available from 1 to 8 rows deep, with finned heights of 12 to 36 inches, and finned lengths up to 10 feet. Aluminum fins on seamless copper tubing are standard, though copper fins may be ordered. Casings come in heavy gauge galvanized steel or aluminum, with connections for left or right hand.

When perfect performance depends on correct design, specify H&M coils. Ask your wholesaler for complete information or write to Halstead & Mitchell, Bessemer Bldg., Pittsburgh 22, Pa.

Finned Coil Products • Air-Cooled Condensers • Water-Cooled Condensers • Cooling Towers



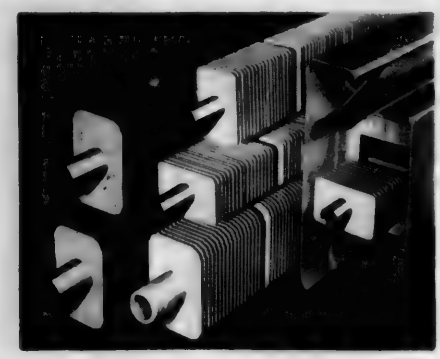
H&M's EXCLUSIVE TURBU-FLO FIN

HM Halstead & Mitchell

(Continued from page 110)

"5 in 1" Baseboard Radiation

The Rittling Corp., Buffalo, N.Y., announces what is described as a new idea in baseboard radiation. Using one size enclosure to accommodate five different finned tube heating elements, this "5 in 1" baseboard radiation reduces inventory and provides a range of capacities per



lineal foot to meet short and long room requirements.

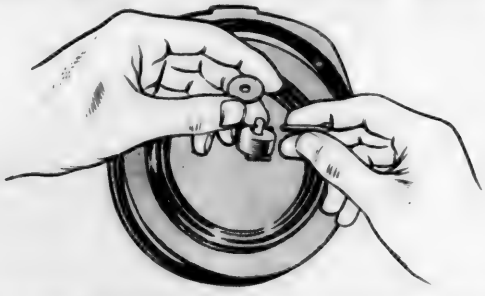
Adjustable expansion panels permit using stock length units without field cutting and fitting. These adjustable expansion panels snap into place. Inside back-corner panels give a neat finished look to the back panel assembly, and save mitering work on the job. Another new feature is an arrangement for supporting return piping within the enclosure to keep the pipe out of view.

More information? Circle Item 27, postcard, last page.

Draft Regulator Pre-Balanced

A new No. 34 factory pre-balanced draft regulator with foul-proof and corrosion-proof vane adjustment has been announced by Walker Mfg. & Sales Corp., St. Joseph, Mo. The new vane-adjusting feature, says the manufacturer, makes precise setting to any prevailing draft conditions as simple as picking up a stack of coins.

Setting is accomplished merely by adding or removing



one or more counterweight discs on the back of the damper vane. Because of the extreme simplicity of the feature, termed the Pick-Off, nothing can clog or foul, the manufacturer states. Over-all range of draft varies from 0.005 to 0.15 inches of water column.

In addition, the light, rigid, cast-aluminum frame, a new design, and die-formed, aluminized steel damper and parts prevent rust or corrosion. Each of the regulators is pre-balanced for exact equilibrium of the damper's weight between the hinge pivots to provide extreme sensitivity to draft fluctuation. Above-center vane suspension gives more stable counter action to draft fluctuation and is said to eliminate flutter and over-compensation that cause smoking and puffing.

More information? Circle Item 28, postcard, last page.

Stainless Steel Classroom Sink

Versatile mirror-finish stainless steel sink from Jensen-Thorsen Corp., Addison, Ill., incorporates fountain and faucet, and comes in single and double bowl models. The sturdy, heavy-gage stainless steel fixture is intended for

kindergartens and primary grades. Rounded sink contours keep soil and bacteria from collecting, an important advantage when many youngsters must use the facility, the company states.

Since simple soap and water cleaning is sufficient in most cases to maintain the sink, it is believed that school superintendents and principals will welcome its installation and easy upkeep. Two sizes—18x24 inches and 32x31 inches—are currently in production.

More information? Circle Item 29, postcard, last page.

Pneumatic Switch Mechanisms

Added to the line of J-1 pneumatic switch mechanisms manufactured by Magnetrol, Inc., Chicago, Ill., is Model J-1 S-1 VP tandem head that combines a two-level stage switch action to provide an electrical switch mechanism. in a vapor-proof and explosion-proof switch housing. mounted physically over a pneumatic switch mechanism.

The head can be so set up that either electric or pneumatic action can be secured as the first stage on rising or falling level, regardless of the physical positioning of each mechanism.

The mechanisms, using either air or gas as the operating pressure medium, are available with all styles of the company's actuators.

This development in the company's line of switch mechanisms makes possible such applications as: air-operated level control, such as spring-loaded diaphragm valve with overriding electric action at high level for high-level alarm or shutdown; air operated level control for underriding electrical action at low level for low-level alarm or shutdown; and others.

More information? Circle Item 30, postcard, last page.

(Continued on page 114)

POOR VENTILATION CAN LEAD TO THIS...

ON STRIKE

Hartzell ventilation can help prevent it

Bad ventilation is seldom the sole cause of a labor dispute, but it's often a contributing factor. Unpleasant working conditions are bad for morale. Smoke, heat and fumes cause discomfort . . . and discomfort breeds discontent.

Effective control of heat, smoke and fumes, can do wonders for morale . . . and for production efficiency. Good working conditions mean good spirits . . . and a minimum of accidents, errors and absenteeism.

Whether you're concerned with the operation of an existing plant or the design of a new one, Hartzell's complete line includes the equipment you need to insure effective ventilation. Ask your nearby Hartzell representative for details. If you don't know him, drop us a line for his name and address.

here's a complete line of air moving equipment designed and built specifically for industry

Other famous Hartzell products include controllable and full feathering propellers for light aircraft, crop drying equipment and farm ventilating fans.
HARTZELL

HARTZELL PROPELLER FAN COMPANY
Div. of Castle Hills Corp. A Member of AMCA
55 Thomas Blvd. Piqua, Ohio
Engineering Offices in Principal Cities

(Continued from page 112)

Electronic Indicator

A clearly visible electronic indicator, Model 721, whose use, with accessories, is to indicate values of flow, liquid level, temperature, pressure, position, input motion; per cent O_2, CO_2, and H_2; pH, resistance and dc millivolts, is announced by The Hays Corp., Michigan City, Ind.

Either one of two electronic receiver units can be incorporated for operation with suitable transmitters—a differential transformer receiver, or a slidewire receiver. Both units have a full complement of accessories which can be mounted on each, including switches and slidewires.

Model 721 gives 300° indication. Its total scale length is 12¾ inches. Accessory terminals and adjustments are readily available with door of the unit open. Scale is easily removed and replaced without recalibration.

More information? Circle Item 31, postcard, last page.

Branch Connection Fitting

Forge and Fittings Div., H. K. Porter Co., Inc., Roselle, N. J., introduces a low pressure branch connection fitting. Called the W-S Fishmouth, the fitting takes the place of shop or field fabricated saddle joints and shaped nipples. It also replaces reducing tees and other methods of making branch connections, and greatly reduces costs, the company reports. It is available in sizes from 2 through 12 inches to fit run pipes up to 36 inches. Pressure rating is 55% of the maximum working pressure of the Schedule 40 run pipe the branch is attached to.

Basically, it is the same fitting that the contractor has been making himself for years. But it is considerably less expensive, consistently accurate in shape, greatly reduces on-the-job time, and winds up making a better joint, according to the company.

More information? Circle Item 32, postcard, last page.

(Continued on page 116)

Here's the LOW COST Answer to the Hot Water Problem for Coin-operated Laundries, Restaurants, Motels, Schools, Clinics, Apartments, Small Plants

EWING HEAVY-DUTY AUTOMATIC COMMERCIAL

Uses Any Type Gas

Vertical—Requires So Little Floor Space!

No Expensive Storage Tanks Needed!

Low Original Cost!
Economical Operation!
Trouble-Free Operation!
Simple To Install!
Automatic Controls!

Write or wire for prices and complete details

Hot Water Heater

Provides a constant, plentiful supply of 180 degree HOT WATER! Automatic TROUBLE-FREE operation! Compact! . . . Quickly and easily installed . . and ABSOLUTELY SAFE! Amazingly efficient and economical. Ask a Ewing user what he thinks of his Ewing heater.

THREE SIZES:—190,000—315,000—520,000 BTU input. Recovery capacities up to 500 gallons per hour at 100 degree temperature rise. Storage capacities 50 to 145 gallons. Inside surfaces treated with metal protective to assure long life and clean, clear water. Heavy duty magnesium rod incorporated with each unit.

Constructed in accordance with requirements of A.S.M.E. Boiler and Pressure Code. Each heater is registered with National Board of Boiler and Pressure Inspectors. All Safety controls listed by AGA.

Ewing MANUFACTURING CO.
2545 NW 10 P. O. BOX 875
OKLAHOMA CITY, OKLA.

*ONE MILE OF STRIPLINE (slot type) DIFFUSERS

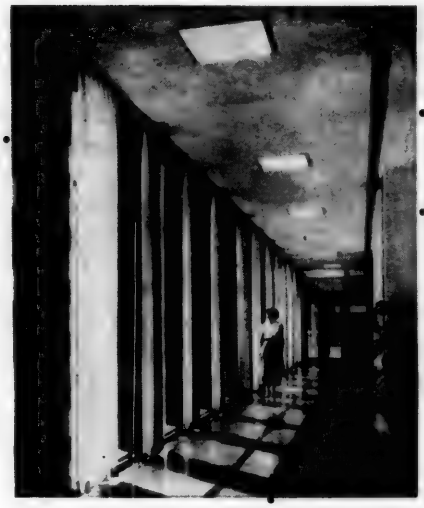
Architects — Perkins & Will, Chicago, Ill.
Air Conditioning & Ventilating Contractors — The Robert Irsay Co., Skokie, Ill.

Installed in Administrative and Research Center

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Skokie, Illinois

STRIPLINE . . . Versatile, Inconspicuous, Practical



all photos by Hedrich-Blessing, Chicago

Stripline slot type diffusers guarantee the greatest possible uniformity of air flow while enhancing the modern architectural design.

Regardless of length of the Stripline diffusers installed, these slot type units provide unvaried distribution of noiseless, draftless, conditioned air. Cold or hot spots are completely eliminated.

Stripline is versatile . . . inconspicuous . . . practical . . . , can be located anywhere to suit the interior design . . . in walls . . . ceilings . . . coves . . . moulds . . . window stools.

For complete engineering data ask for Stripline catalog.

air diffusers • filters • exhausters
registers and grilles

Sold exclusively by representatives for:

AIR DEVICES INC.

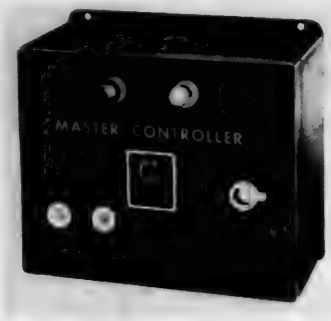
185 MADISON AVENUE, New York 16, N. Y.

(Continued from page 114)

Master Controller

A master controller for use with automatic combustion control systems or comparable industrial applications is announced by Cleveland Controls, Inc., Cleveland, Ohio.

Fully automatic, the heavy-duty sensing and controlling instrument is responsive to minute changes in pressure or temperature, transmitting line voltage signals to other system components for control of firing rate, temperature



positioning, valving, or other regulations. With this controller, the company states, fire rate and other process functions are greatly modulated in accurate proportion to load demands.

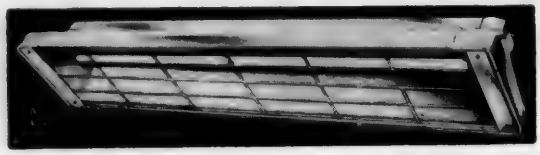
Controller features heavy-duty construction for long life and dependable operation even under adverse conditions.

Models for controlling steam pressure are available in standard ranges of 0 to 30, 20 to 100, and 75 to 300 psi. Models are also available for controlling temperatures to 750 deg F.

More information? Circle Item 33, postcard, last page.

Infrared Spot Heater

An infrared electric spot heater called Solaray, for outdoor and indoor applications, is offered by Wiggin Products Co., Inc., Boston, Mass. According to the company, it controls and focuses heat exactly where it is needed.



Both residential and industrial applications are suggested by the manufacturer. Included are patios and outdoor swimming pools, truck loading platforms, and in-plant assembly lines.

A quartz heating element transmits infrared heat rays that can be focused on any given area. Units are said to be extremely efficient, hence inexpensive to operate, with high resistance of the heating element to shock and weather. Available in 110, 208 and 230 volt units.

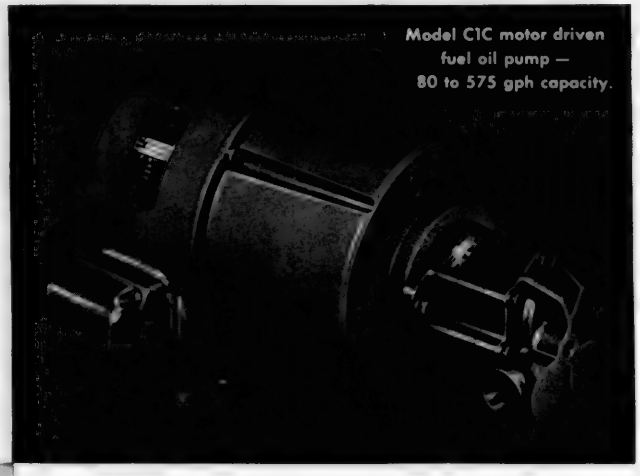
More information? Circle Item 34, postcard, last page.

(Continued on page 118)

Webster fuel oil handling equipment

from tank to burner—
a complete line for all commercial and industrial applications

Problems in handling fuel oils? High lift, big capacity, heavy No. 5 and No. 6 grades? Webster has the answer in a full line-up of pumps—supply, transfer, booster and burner models. Choose from direct drive or belt-driven units—in a wide capacity range. Webster pumps are compact, install with a minimum of plumbing. With each you get a full measure of dependable operation to match the most rugged and demanding service.


Model C1C motor driven fuel oil pump — 80 to 575 gph capacity.

RV-2000 fuel oil regulating valve
For all fuel oils — No. 1 through No. 6. Combines pressure regulation and cut-off. Capacities up to 100 gph. Pressure ranges — 80 to 150 psi, 90 to 250 psi.

call the man from Webster
— or write for engineering bulletins FU3-1, FU3-2, FU3-3

HEATING DIVISION
WEBSTER ELECTRIC
RACINE · WIS
our 50th year

GUARANTEED FOR LIFE!

Stainless steel U-spring noise and vibration isolators . . . a Jenn-Air exclusive!

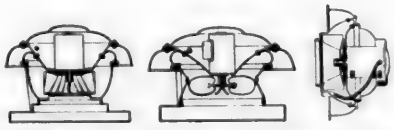
Most power exhausters depend on rubber isolators to dampen noise and vibration. Rubber does a reasonably good job when new, but it cannot withstand the ravages of heat, moisture and oil. Eventually, like the tires on your car, rubber isolators break down, leaving you with expensive repair bills or the need for complete exhauster replacement.

Dissatisfied with the impermanent nature of rubber, Jenn-Air engineers set out to develop a vibration isolator that would not break down. What they perfected was a unique power assembly suspension system built around stainless steel U-springs. Three to five U-springs are now used in each direct driven Jenn-Air Exhauster. They eliminate noise by isolating both radial and lateral vibration . . . and they're *guaranteed for life.*

In addition to providing lifetime service, Jenn-Air U-springs absorb 44% more vibration than rubber isolators. This fact was proved conclusively in independent tests conducted by the Pittsburgh Testing Laboratory.

Effective elimination of vibration is the key to quiet operation and long exhauster life, and Jenn-Air does this job better than any exhauster made! Jenn-Air's complete line of spun aluminum exhausters for roof and wall installation is covered in Bulletin 58-B . . . write for your copy today.

First Name in Power Exhausters



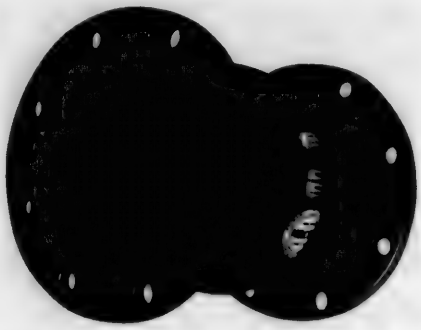
JENN-AIR

Jenn-Air Products Co., Inc. • 1102 Stadium Drive, Indianapolis 7, Ind.

(Continued from page 116)

Rubber Expansion Joints

A line of spool-type rubber expansion joints designed for virtually every industrial and marine application is announced by Mercer Rubber Co., Hamilton Square, N. J. These expansion joints are performing uninterruptedly in such applications as in air conditioning ducts, air injection lines, ballast lines for ships, air and gas blower lines to condensers, dry vacuum lines, jet condensers, paper



stock lines, turbine to condenser lines and similar service, the company states.

Joints range in nominal pipe sizes from 2 to 72 inches. They are available for working pressures up to 125 psi depending on the type and for service where temperatures do not exceed 200 deg F. Special types can be manufactured to operate up to 250 deg. Joints are regularly supplied in three types: for pressure; for vacuum; and for pressure and vacuum.

To provide long service life, expansion joints are fabricated from a specially compounded high grade rubber, developed for maximum flexibility, non-set characteristics, and non-cracking and non-fracturing features even after repeated flexing due to expansion or contraction of the joint. The carcass is manufactured of extra strong duck, frictioned with this high grade rubber compound. For vacuum service, the carcass is further reinforced with steel rings to prevent collapsing. Expansion Joints can be designed and built to meet special operating conditions involving oils, gases and chemicals.

More information? Circle Item 35, postcard, last page.

Masonry Sawing Equipment

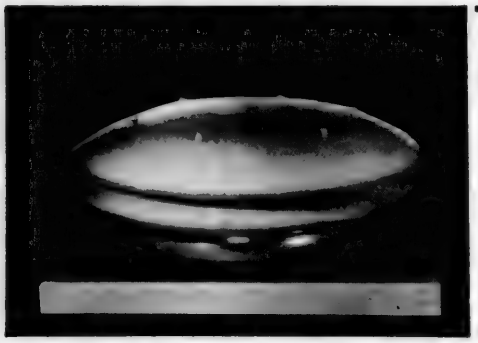
A full line of masonry, concrete and stone saws and blades has been added to the masonry drilling equipment of Truco Masonry Drilling Div., Wheel Trueing Tool Co., Detroit, Mich. The additional products will bear the Truco trade name.

The complete line of masonry cutting equipment, includes abrasive and diamond blades, two heavy-duty masonry saws, a standard masonry saw, a stone cutting saw, and two concrete cutting saws.

More information? Circle Item 36, postcard, last page.

(Continued on page 120)

NEW AXIAL ROOF VENTILATORS BY WESTERN

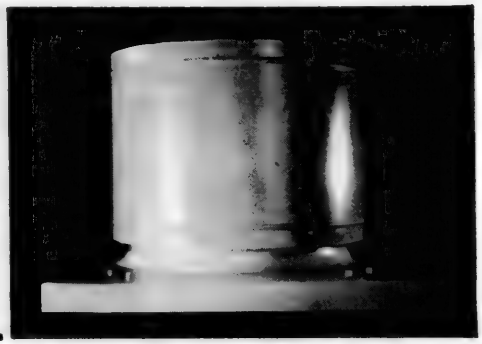


Above: A high efficiency power unit in a low, weather-proof housing. For both commercial and industrial use. 360 degree near horizontal discharge. Aerodynamically correct spun housing. Heavy guage steel, aluminum or non-corrosive Fiberglas* construction.

The Westernaire® Low Silhouette Hooded Exhaust Ventilator

The Westernaire® Low Silhouette Vertical Exhaust Ventilator

Low silhouette high efficiency power roof ventilators for vertical or horizontal air discharge provide motor mounting below the venturi to achieve styling compatible with modern architecture plus a smooth airstream discharge pattern.



Above: High capacity power unit specifically designed for industrial usage. Fumes, smoke, dust-laden and foul air projected high above roof to prevent re-entry into building. "Blow-open" dampers rest on neoprene seal. Completely weatherproof.

Other type ventilators include: Rotary, Stationary, Directional, Continuous Ridge, Unit, Power models.

WESTERN ENGINEERING & MFG. CO.

P. O. BOX 66455, LOS ANGELES 66, CALIFORNIA

*TM- Owens Corning Fiberglas Corp.

Write for catalog and name of nearest representative

Since 1921

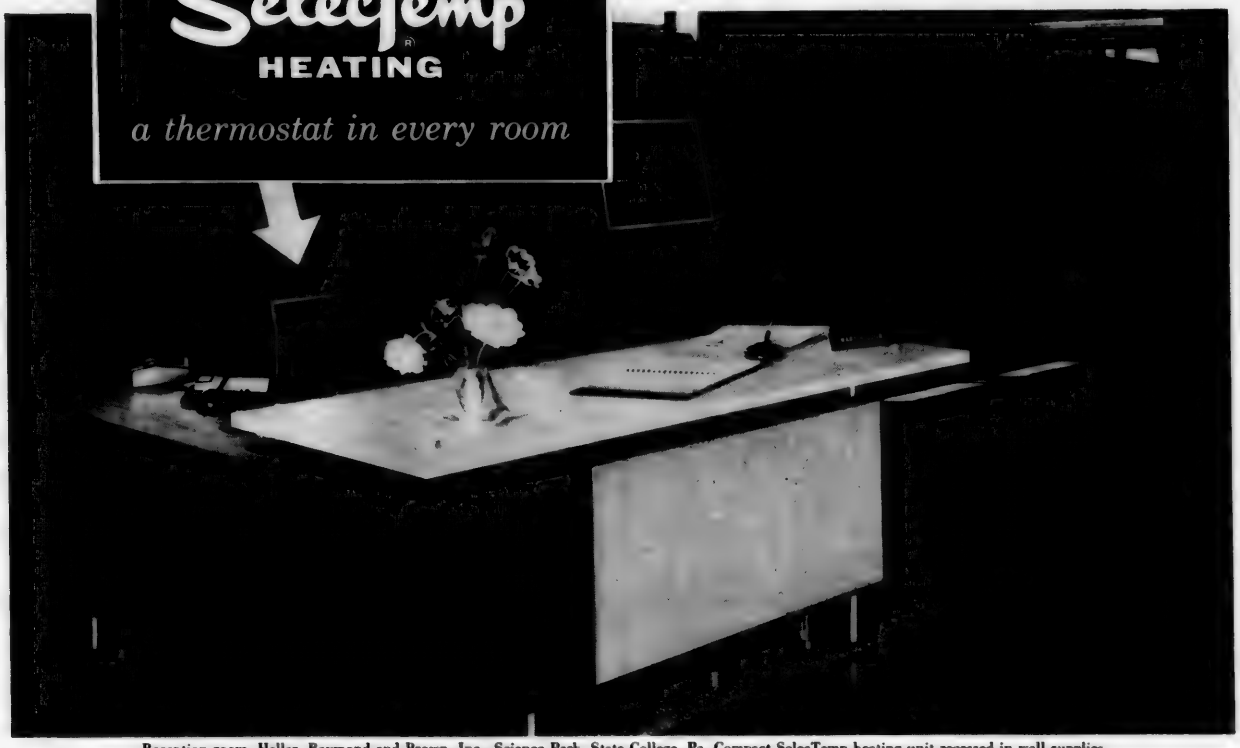
IRON FIREMAN

SelecTemp®

HEATING

a thermostat in every room

Architect, Horace Bailey, Johnstown, Pa. Heating Contractor, Stanton Barnhart, Johnstown.



Reception room, Haller, Raymond and Brown, Inc., Science Park, State College, Pa. Compact SelecTemp heating unit recessed in wall supplies as much heat as a big radiator, plus room-by-room temperature control and constant circulation of filtered warm air. No electric wiring required.

Prominent research firm praises new SelecTemp method of steam heating

Electronic scientists say, "SelecTemp more satisfactory than three other heating systems we have had"

"Outstanding features of SelecTemp heating are easy installation, efficient operation, low maintenance cost, very little deviation in room temperature, and individual room temperature control."

In these words Mr. Roy L. Smeltz, Plant Manager, sums up more than a year of experience with SelecTemp heating in the splendid new research building of Haller, Raymond and Brown, Inc., (division of Singer Manufacturing Co.) an organization of scientists and engineers engaged in electronics research for aeronautical and missile application.

Continues Mr. Smeltz: "In more than a year we have had only minor maintenance adjustments on three SelecTemp units out of 139. We are now completing a second building which has 89 units."

Two new research buildings of Haller, Raymond and Brown, Inc. are equipped with Iron Fireman SelecTemp heating, with a thermostat in every room.

No wasteful overheating; no uncomfortable underheating

The SelecTemp system provides steady, modulated warmth regulated by a thermostat in every room. Warm and cold sides of the building stay in perfect balance. With all of its advantages, SelecTemp costs no more than many systems that have no room-by-room regulation. Low maintenance costs and substantial fuel savings are a universal experience in SelecTemp heated homes and buildings. Steam for heat and steam-powered air circulation is supplied by a central low pressure boiler.

Send coupon for full information

IRON FIREMAN MANUFACTURING COMPANY
3157 W. 106th Street, Cleveland 11, Ohio
(In Canada, 80 Ward Street, Toronto, Ontario)

☐ Send SelecTemp specifications and full information.
☐ Arrange for brief demonstration of SelecTemp room unit, in actual operation, in our office.

Name .....
Firm .....
Address .....
City ..... State .....

IRON FIREMAN®
Engineered
heating and cooling

Quickdraft... THE WORLD'S SAFEST

POWER DRAFT UNIT FOR INDUSTRIAL, RESIDENTIAL AND INSTITUTIONAL EXHAUSTING

Increases heating and combustion efficiency!

Provides air power for bulk materials handling!

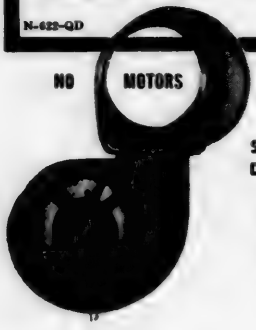
Exhausts corrosive gases and abrasives!

Quickdraft provides industry, commerce, institutions and homebuilders *power draft* engineered for economical and efficient combustion regardless of building or atmospheric conditions. Models suitable for every heating or incinerator application . . . eliminate pulsating or chattering, puffing, smoking and sooting. Reduce building costs, no tall, unsightly stacks required. Quickdraft also provides industry with ¼ inch to 60 inches W.G. static pressure for exhausting corrosive gases, abrasives and paint spray. Heavy-duty, high-pressure models, 6 inches to 30 inches diameter, are available for moving bulk materials or anything that can be moved by air. Because there are no motors, fans or bearings in exhaust line, only Quickdraft avoids costly clogging, corrosion of moving parts or fan failure.

IMPORTANT NOTICE

For withstanding corrosive gases, all Quickdraft units are available in standard acid resisting vitreous enamel, No. 316 Stainless Steel, rigid plastics (P.V.C.) and with plastic and Fiberglas coatings.

N-622-QD



NO MOTORS FANS OR BEARINGS IN EXHAUST LINE

Send for QUICKDRAFT ENGINEERING DATA on your application . . . now.

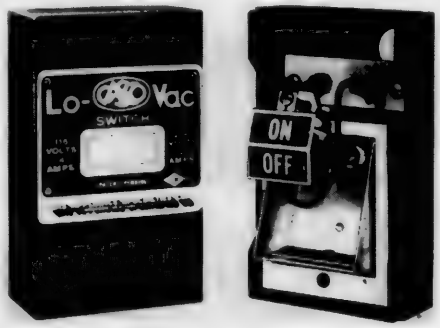
Quickdraft CORPORATION

P.O. Box 87—O Canton 1, Ohio

(Continued from page 118)

Negative Pressure Switch

Announcement of its Gasco Lo-Vac negative pressure switch, which can be used in a wide variety of applications in the potentially hazardous processing industries, is made by Gas Appliance Specialties Co., Inc., Woodside, N. Y.



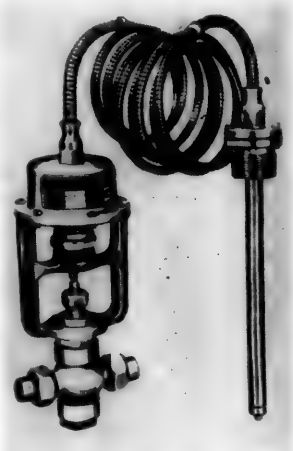
Applications to ovens, steam generators, paint baking, drying and finishing ovens, and stack draft inducers for flue duct draft control, are included. When this switch is installed on the suction side of a system, the company states, it becomes the heart of the system, interlocking ventilating equipment, fuel supply, and safety devices.

The 4-amp, 115-v, or 2-amp, 230-v switch closes at 0.21 inches of water; opens at 0.10 inches. According to the manufacturer, its positive *on* and *off* indicator, showing the position of the switch at all times, is a unique feature.

More information? Circle Item 37, postcard, last page.

Temperature Regulators

A. W. Cash Valve Mfg. Corp., Decatur, Ill., announces a new series of temperature regulators for use on water heaters, fuel oil preheaters, fuel oil coolers, and storage tanks.

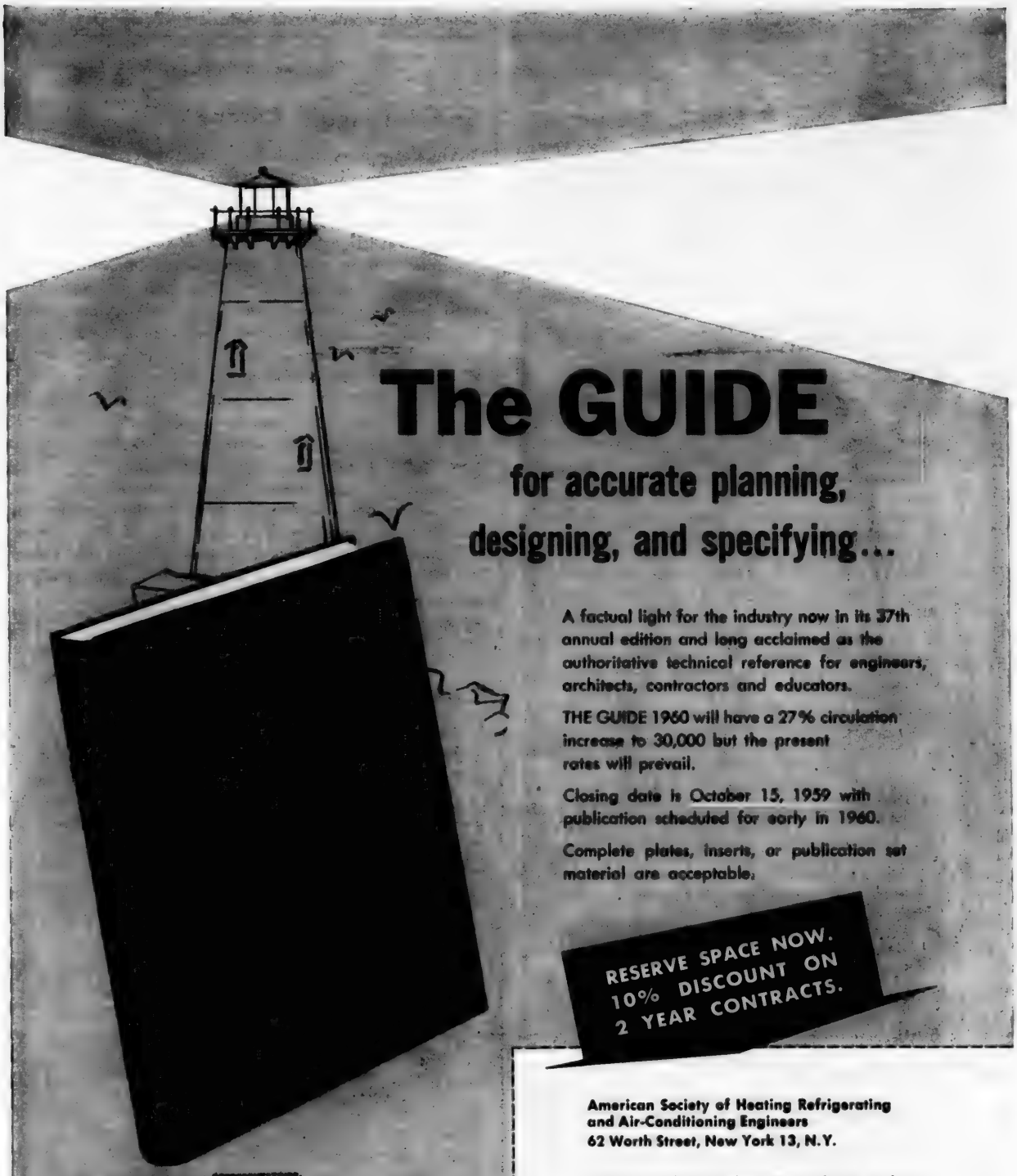


Designated Type TC and TCX, the regulators are designed to control the flow of either heating or cooling fluids. They are vapor-pressure operated, and can be supplied as either direct-acting regulators, for heating applications, or reverse-acting regulators, for cooling applications.

Sizes, capacities, materials, and temperature ranges are described in a bulletin which is available from the manufacturer.

More information? Circle Item 38, postcard, last page.

(Continued on page 122)



The GUIDE

for accurate planning, designing, and specifying...

A factual light for the industry now in its 37th annual edition and long acclaimed as the authoritative technical reference for engineers, architects, contractors and educators.

THE GUIDE 1960 will have a 27% circulation increase to 30,000 but the present rates will prevail.

Closing date is October 15, 1959 with publication scheduled for early in 1960.

Complete plates, inserts, or publication set material are acceptable.

RESERVE SPACE NOW. 10% DISCOUNT ON 2 YEAR CONTRACTS.

REPRESENTATIVES:

Bob Wettstein, 672 S. Lafayette Park Pl., Los Angeles 57, Calif. DUnkirk 8-2286

Urben Farley & Co., 120 S. La Salle St., Chicago 3, Ill. Financial 6-3074

Ralph F. Duysters, 62 Worth Street, New York 13, N.Y. BArclay 7-6266

AMERICAN SOCIETY OF HEATING REFRIGERATING AND AIR-CONDITIONING ENGINEERS
62 WORTH STREET, NEW YORK 13, NEW YORK

American Society of Heating Refrigerating and Air-Conditioning Engineers
62 Worth Street, New York 13, N.Y.

Please send further information and rate card to:

Name _____

Firm _____

Address _____

City _____ Zone ____ State ____

Allen

ROOF VENTILATORS

Here are two widely-used roof fans, typical of Allen engineered ventilation for modern structures and industrial uses:

- Recommended whenever specifications call for a roof fan of low contour without sacrificing high operating efficiency
- Low noise level • Low first cost • Low maintenance
- Easy to install (no extra bases needed) • Easily accessible
- Wide capacity range (420-45,000 cfm) • Belt or direct drive

- Recommended where extremely high discharge velocity is needed to keep fumes from sifting back into the building
- Automatic wing dampers • Capacities up to 90,000 cfm
- Direct drive (moderately dry temperatures up to 160° F.)
- Remote drive (corrosive or high temperatures up to 350° F.)

See Sweet's for the complete Allen line of roof ventilators

MAIL COUPON for specifications and performance data on these and other Allen units

ALLEN ENGINEERED VENTILATION

ALLEN COOLER & VENTILATOR, INC.
ROCHESTER, MICH.

Roof Ventilators for Every Commercial and Industrial Need

REPRESENTATIVES IN PRINCIPAL CITIES

ALLEN COOLER & VENTILATOR CO.
712 WOODWARD AVE., ROCHESTER, MICHIGAN

Please send catalog of the Allen ventilator line, including specifications and data on the I-line and VD roof fans.

Firm

Name

Address

City Zone State

(Continued from page 120)

Special Liquid Chiller

The Force-Flow liquid chiller, manufactured by Remcor Products Co., Chicago, Ill., is for the refrigeration, circulation, and closely controlled temperature of water, liquid chemicals or acids, or many types of corrosive or non-corrosive liquids.

Chiller can be used in scientific and laboratory work, chemical, photographic and lithographic processes, transistor and electrical parts testing, cool quenching, product cooling during manufacture, etc. It is available in ¼, ⅓, and ½ hp sizes with air or water cooled condenser and will maintain bath temperatures in ranges from −30 to +75 deg F within ±2 deg, ±½ deg, or ±1/10 deg.

Models with temperature ranges of +15 deg to +75 deg are equipped with corrosion resistant Zytel nylon pump with stainless steel shaft and fittings.

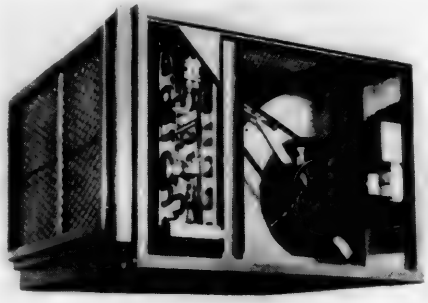
Condensing unit, heat exchanger, liquid pump, and controls are one complete assembly to which connections can be made with practically any type of flexible hose. For operation, unit needs only to be plugged into electrical outlet. If desired, chiller is available in attractive gray metal cabinet.

More information? Circle Item 39, postcard, last page.

Conditioner for Spot Cooling

Series HB dual-purpose air handling units, in 2, 3, 4, and 5-ton sizes, are designed for spot cooling by Fraser-Johnston Co., San Francisco, Calif.

Unit is suitable for free suspension in the area to be cooled, with the addition of a double deflection discharge



head and a filter screen. It may be installed in busy areas, such as supermarkets, without hampering daily activity. The usual application of these units in horizontal duct work, of course, applies.

By the use of large fans with low tip speed, maximum air velocities are achieved at a very low noise level. The 5-ton model features twin blower wheels. A condensate pump is available to discharge condensate where a natural drain is not available.

Hot water or steam coils and electrical space heater elements are available for these units on special order.

More information? Circle Item 40, postcard, last page.

(Concluded on page 124)

Simplifying Field Survey Data
How to make a survey — Sample survey form

Basic Design Data
Design coordination — Design data form

Plumbing Codes
Code variations — Interpretation — Revising a code — National plumbing code

Footing Drains Around Buildings
Installation — Cleanouts — Sand interceptors

Location and Construction of Dry Wells
Sizing — Construction — Location

How to Install Drainage Piping in Fill
Compacted soil — Fill — Piping support

Function of Drainage Basins
Rainfall disposal — Dry Wells — Drainage basins

Protection of Site Utility Lines
Project utilities — Underground dangers — Trenching

Sub-surface Water Conditions
Piping arrangement — Waterproofing — Sewage ejectors

Design and Construction of Manholes
Location — Shape — Materials

Water Supply for Construction Projects
Responsibility — Piping — Installation — Connections

Access Space for Plumbing Fixtures
Design data — Advantages — Clearances

Wet Columns in Multi-story Buildings
Water and waste facilities — Spacing — Arrangement

Fixture Roughing for Low Rent Housing Projects
Typical layout — Space requirement — Economy

Vent Stack Terminal
Roof penetration — Flashing — Protection

Preventing Sewage Backflow in Buildings
System separation — Piping — Valves

Sump Pump Installations
Basins — Special conditions — Code compliance

Importance of Cleanouts in Building
Kinds of cleanout — Storm water

How to Install Exterior Cleanouts
Ground settlement — Grass surfaces — Paved top

Flexible Arrangement of Rest Room Facilities
Old and new buildings — Fixture roughing

Providing Access for Building Traps
Shallow installations — Concrete pits — Backwater valves — Watertight installations

Service Hot Water for Schools
Determining needs — Generation equipment — Storage

External Indirect Water Heaters
Capacity — Operation — Circulation — Supply

Two-Temperature Service Hot Water
Methods — Generators — Dual installation

Economy in Service Hot Water Generation
Condensate coolers — Storage — Piping

Supports for Hot Water Storage Generators
Location — Clearances — Sizing — Suspension

Water Hammer Arrestors
Water hammer causes — Methods of control — Devices

Balancing Service Hot Water Systems
Circulation — Upfeed systems — Valving — Controls

Interception of Volatile Fluids
Floor drainage — Fire hazard — Multi-story installations

Expansion in Hot Water Piping Systems
Expansion rates — Devices — Hangers — Anchoring

Increasing Water Supply Pressure in Buildings
Street mains — Tankless, pneumatic and roof tank systems

Gas Service for Multi-story Buildings
Distribution — Main support — Expansion — Safety

First Aid Fire Protection
Occupancy — Standard and extra equipment

Fire Protection for Apartment Houses
Standpipe system — Piping — Water supply — Hose stations

Fire Protection in Tall Buildings
Standpipe systems — Siamese connection — Fire pumps — Hose stations — Roof manifold — Roof tank

Parking Area Drainage
Methods — Sump pumps — Dry wells — Basins

Storm Drainage System for Flat Roofs
Rainfall intensity — Types of drain — Flow — Connections — Piping

Water Service for Research Laboratories
Distribution piping — Supply separation — Hot water systems — Laboratory benches

Emergency Protection of Laboratory Personnel
Emergency devices — Showers — Location — Types

Drinking Water Systems
Fountains — Coolers — Roughing in — Central systems

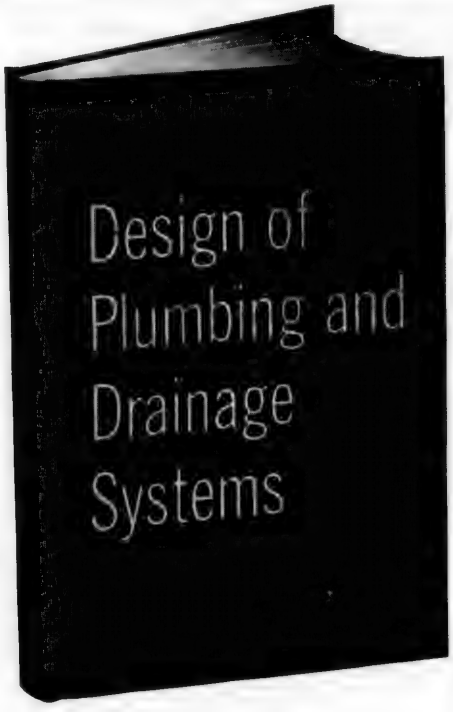
Distilled Water Systems
Distilling units — Storage tanks — Central systems

Fixtures for Mental Hospitals
Rest rooms — Lavatories — Water closets — Roughing in — Shower rooms — Private rooms

Plumbing Systems for Motels
Motel units — Arrangement — Access — Fixtures

Water and Drainage Facilities for Animal Quarters
Cage cleaning — Drainage — Waste systems

Draining the Planting Area
Interior areas — Roof areas — Exterior planting



ALL THIS INFORMATION ON MODERN PLUMBING PRACTICE AND DESIGN IN ONE BOOK!

Louis Blendermann, well-known authority, draws upon more than twenty years of plumbing design experience to present this encyclopedia coverage of modern plumbing practice and design.

If you are an engineer or contractor the profuse and detailed illustrations of specialized and modern installation techniques will be of value to you. DESIGN OF PLUMBING AND DRAINAGE SYSTEMS is also a detailed guide for the young designer and a complete reference manual for the experienced designer who meets a new and unusual problem.

To order, use coupon below or circle letter F on postcard, last page.

328 Pages

201 Illustrations

$7.00

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

Please send me ..... **copies of Design of Plumbing and Drainage Systems.**

☐ **Check or money order is enclosed. Send book (s) postpaid.**

☐ **Send book (s) and invoice, including postage. I will pay within five days if I decide to keep the book (s).** ☐ **Bill me** ☐ **Bill company**

Name .....

Company .....

Company Address .....

City ..... **Zone** .. **State** ....

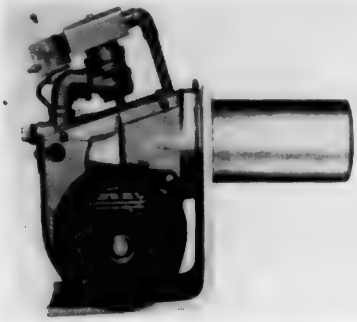
Home Address .....

(Please fill in if you want book sent to your home) ACHV/10/59

(Concluded from page 122)

Automatic Power Gas Burner

A completely automatic power gas burner, announced by Cox Mfg. Co., Ridgeville, Ind., is said to be quieter, safer, and more economical. Under the name Wondaire, burner is said to eliminate rumbles and booms, prevalent when many burners start or stop.



Unit is shipped completely assembled and ready to install. Handy inspection panels near burner and blower make both readily accessible during and after installation. The burner serves with natural, mixed, or LP gas.

Burners are available in two ranges: 90,000 to 260,000 Btu per hr and 200,000 to 400,000 Btu per hr.

More information? Circle Item 41, postcard, last page.

Blower Has Adjustable Speed Motor

Static pressure may go up or down, but the cfm remains the same with the "Fixed Flow" motor blower developed by Viking Air Products Div., National-U.S. Radiator Corp., Cleveland, Ohio. It does this by automatically adjusting its speed to compensate for changes in internal resistance of the furnace or the kind of duct work that an installer is likely to encounter.

The characteristics of the blower result from joining a specially designed blower with a compatible motor having particular specifications.

This blower, which is designated as Series T, runs at a slower speed, has larger inlets and a larger discharge opening, and is therefore inherently more quiet than any conventional direct drive unit, the company states.

More information? Circle Item 42, postcard, last page.

YOUR IDEAS WORK BETTER WHEN YOU WORK WITH HONEYWELL

THE FOLLOWING pages bring you some of the latest developments in automatic controls from Honeywell. They widen your choice of products; give you more to work with.

For complete information on these new control products and systems, call your nearest Honeywell sales office. Honeywell provides 112 sales offices throughout the country. Each is staffed with control specialists to assist you in writing specifications and preparing control layouts.

NOW! FLUTTER-JET WASHING

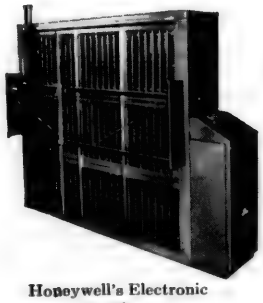
Another first for Honeywell's ELECTRONIC AIR CLEANER

Actual unretouched strobelight photograph taken at 1/2,000 second.

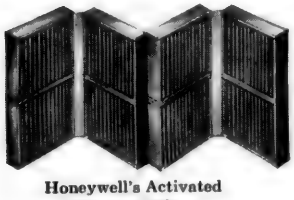
Never before such a quick, efficient way to wash electronic air cleaners! Honeywell's new flutter jet washer literally *blasts* water throughout the air cleaner, with a fluttering, sweeping action that flushes away accumulated dirt quickly—cleans every part thoroughly. The new flutter jet nozzle never clogs.

Honeywell's Electronic Air Cleaner

Removes 90% or more of all airborne dirt



Honeywell's Electronic Air Cleaner



Honeywell's Activated Charcoal Filter

You can now select from three types of cells: (1) *Hi Velocity*—for 90% or more dirt removal or where space is limited. (2) *Standard*—for normal conditions, provides high efficiency dirt removal and high dirt capacity. (3) *Hi Load* for handling high dirt concentration.

With these 3 different cell capacities, you can have complete freedom in designing your plenums. Just select the cell type and number of cells that will give you the air cleaning capacity you need in the plenum space available. No longer is it necessary to design your plenum to fit the air cleaner.

Remove Odors, Too

For the ultimate in air cleaning, team up Honeywell's Electronic Air Cleaner with the Activated Charcoal Filter—for removal of *all odors and gases*, too. Only Honeywell offers this *exclusive* combination.

For more information about Honeywell air cleaning, call your nearest Honeywell office. Or write: Minneapolis-Honeywell, Department HV-10-141, Minneapolis 8, Minn.

Honeywell

H HONEYWELL First in Control

Now! A master control for your central fan system—

New Honeywell Transistorized control comb

Five adjustment knobs give you finger-tip control of duct temperature from one location

- Adjustment for throttling range of controlling thermostat
- Factory calibration adjustment knob
- Adjustment for outdoor air thermostat effect
- Adjustment for second thermostat effect
- Adjustment for calibration and control point

The following additional features offer you extra protection, extra convenience: rugged mounting case made of 16-gauge steel, reinforced top and bottom; hinged, swing-out panel for easier servicing; easy-to-read terminal connections that reduce chances of wiring errors; separate terminal strip for panel power; ample number of knockouts (seven at top, seven at bottom) for easier installation.

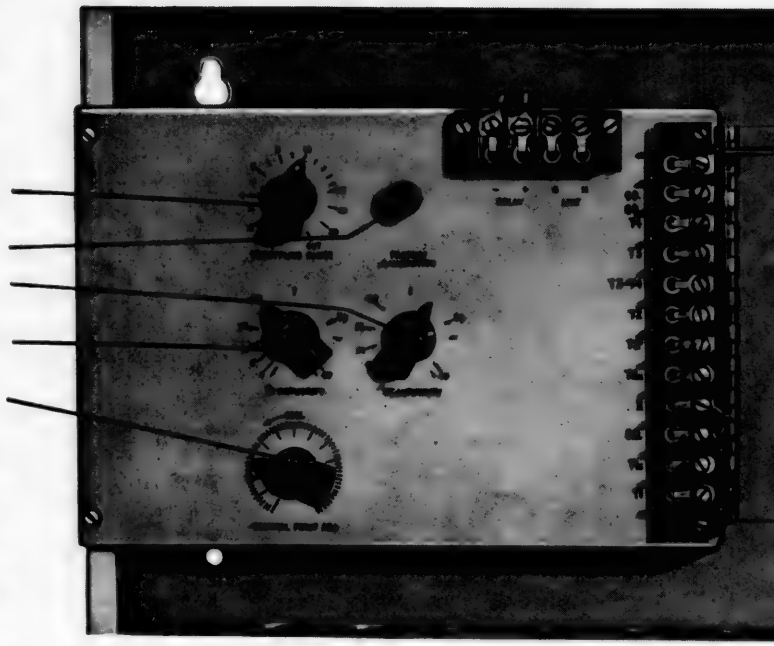
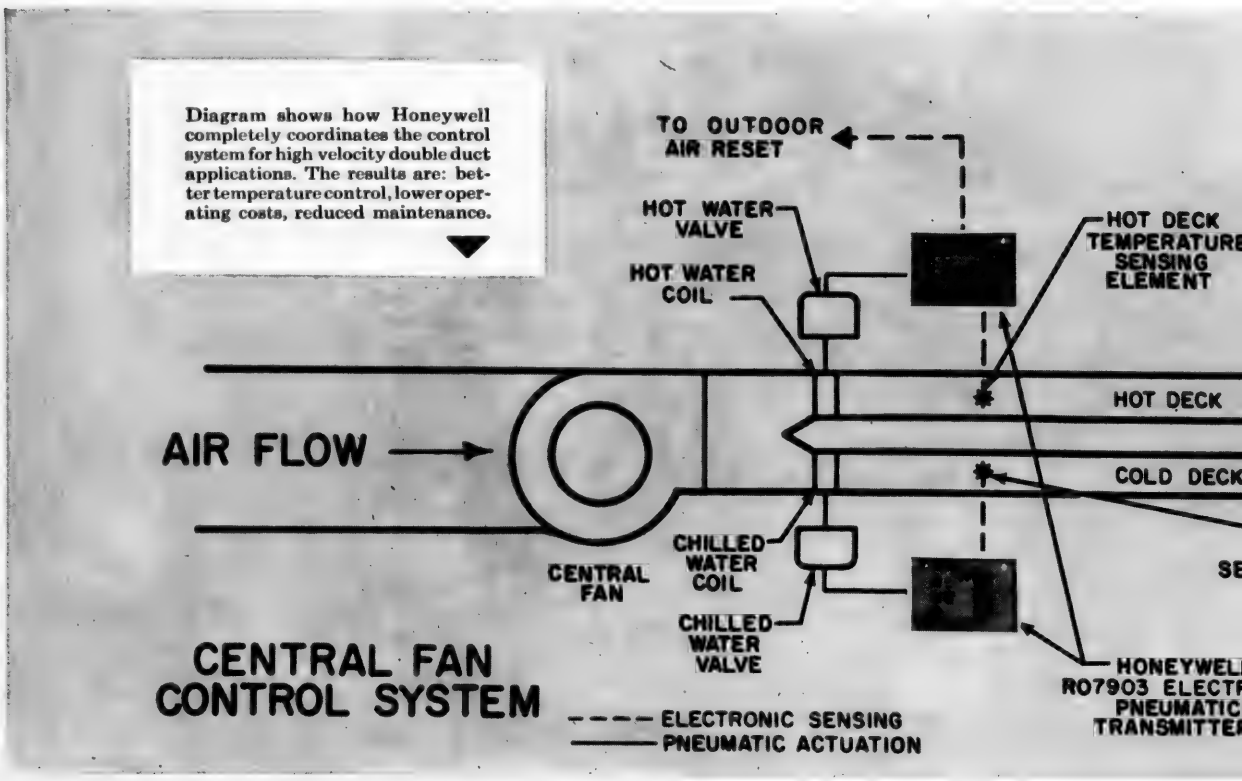


Diagram shows how Honeywell completely coordinates the control system for high velocity double duct applications. The results are: better temperature control, lower operating costs, reduced maintenance.



ines the best of electronics and pneumatics!

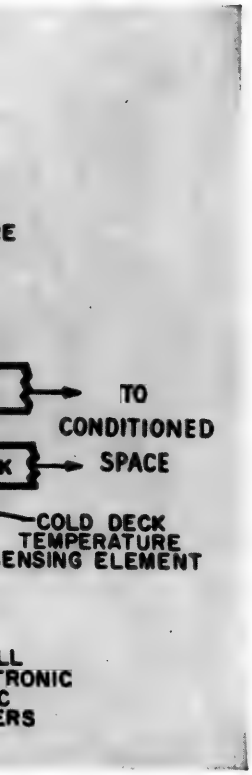
This new relay combines the sensitivity and versatility of electronic sensing with the powerful, rugged economy of pneumatic actuation—your assurance of better control performance!

Now you can completely co-ordinate the control of your air conditioning system from a single location! The new Honeywell Electronic-Pneumatic Transmitter eliminates difficult, inexact adjustments at sensor locations—and, there's a free choice of locations because sensors are now adjusted at the central panel.

This new relay combines the sensitivity, freedom from ambient temperature effect, fast response and versatility of *electronic sensing* with the powerful, rugged economy of *pneumatic actuation*. It's the perfect combination of functional advantages needed to do a better control job for you.

Two compact, rugged transistors handle the R07903's power load with plenty to spare—your assurance of trouble-free performance and longer life.

Honeywell's new Electronic-Pneumatic Transmitter offers you a choice of specialized sensing elements as shown below. For more information about the many ways the R07903 can serve you, call your nearest Honeywell office today or write Minneapolis-Honeywell, Dept. HV-10-141, Minneapolis 8, Minnesota.

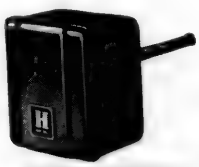


Honeywell offers you a wide choice of specialized sensing elements for use with the R07903 transmitter!

These elements have no moving parts, require no adjustments and provide faster, more accurate response. They are simple coils of temperature sensitive wire —dustproof, tamperproof, foolproof— that insure your systems long years of dependable, trouble-free service.

Relay connections are made with simple, standard low-voltage wiring, and can be manufactured in various shapes and sizes for easy fitting to each individual installation. Element lengths for duct measurements vary from 4 inches to a special averaging model of 27 feet.

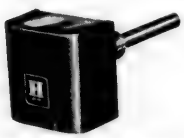
INSERTION ELEMENTS



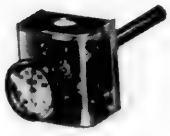
DUCT ELEMENTS

OUTDOOR ELEMENT

AVERAGING DUCT ELEMENT



INSERTION ELEMENT



DUCT ELEMENT

DUAL-ACTING DISCHARGE ELEMENT

NEW LITERATURE

Use the prepaid postcard on last page for securing your copies of these catalogs.

Individual-Room Air Conditioners

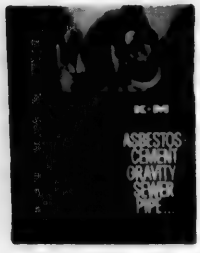
Latest literature from Drayer-Hanson, div. of National-U. S. Radiator Corp., Los Angeles, Calif., describes Spotaire LRC individual-room air conditioners. Data sheet contains specifications and ratings for four models of the unit which offers 3-way use.

Circle **Item 43** on Inquiry Card

Electronic Air Cleaners

A new line of electronic air cleaners, called the Selector series, is described in 12-page Catalog 76-4369, published by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. Line offers a wide selection of units to meet every air-cleaning requirement. Selection data are featured.

Circle **Item 44** on Inquiry Card



Gravity Sewer Pipe

Asbestos-cement gravity sewer pipe, designed for economical, long-lived non-pressure sewer systems, is described in a 4-page folder published by Keasbey & Mattison Co., Ambler, Pa. Dimensions and tolerances, as well as other specifications needed by the engineer, are included.

Circle **Item 45** on Inquiry Card

Sound Control Products

Acoustical Div., Elof Hansson, Inc., New York, N. Y., announces 12-page Catalog 60 describing the company's most modern types of industrial and commercial sound control products. Construction details and recommended installation, maintenance and application methods are included.

Circle **Item 46** on Inquiry Card

Industrial Insulations

A 4-page brochure, from The Philip Carey Mfg. Co., Cincinnati, Ohio, describes company's industrial insulations and insulating cements. Selection guide indicates applications for high temperature and superheated surfaces, cold water pipes, and heating and air conditioning ducts.

Circle **Item 47** on Inquiry Card

System-Engineered Components

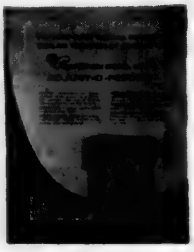
An 8-page bulletin, Catalog No. 300B, available from Acme Industries, Inc., Jackson, Mich., describes the company's system-engineered components. All necessary engineering data are presented for shell and tube condensers, shell and coil condensers, heat exchangers, and liquid receivers.

Circle **Item 48** on Inquiry Card

Instrumentation and Control

An 8-page condensed catalog is offered by The Hays Corp., Michigan City, Ind. In seven sections, it describes all-electric combustion control systems which, when coordinated with boiler room instrumentation, provide fully automatic combustion control; also, Hays industrial instruments.

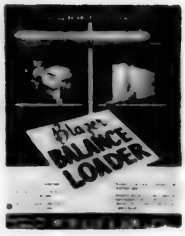
Circle **Item 49** on Inquiry Card



Compact Proportioning Pump

B-I-F Industries, Inc., Providence, R. I., announces a bulletin describing a plunger-type, small-capacity proportioning pump for the accurate and efficient treating of small, low pressure boilers. The 2-page bulletin contains engineering and dimensional data and a list of chemicals handled.

Circle **Item 50** on Inquiry Card



Balance Loaders

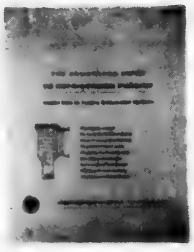
A 4-page bulletin, BL-5, published by M. Blazer & Son, Passaic, N. J., describes the company's Balance Loader. It explains the need for a means of balancing compressor cooling capacity to prevailing load, and shows how the Balance Loader fills this need. Applications are discussed.

Circle **Item 51** on Inquiry Card

Dielectric Pipe Unions

An 8-page bulletin, DU-19, from Epco Sales, Inc., Cleveland, Ohio, describes the company's dielectric pipe unions. The unions are designed for connections between dissimilar or similar metals, in any plumbing system, to control corrosion caused by galvanic or electrolytic action.

Circle **Item 52** on Inquiry Card



Purging Refrigeration Systems

A 12-page bulletin, issued by Armstrong Machine Works, Three Rivers, Mich., presents helpful data on the automatic removal of air from refrigeration systems. It describes why purging is necessary, how non-condensible gases affect efficiency, and methods of purging.

Circle **Item 53** on Inquiry Card

Fire Protection Equipment

W. D. Allen Manufacturing Co., Bellwood, Ill., has prepared an illustrated booklet, called Fire Check Book, as a guide in specifying non-sprinkler fire protection equipment. It covers the selection and installation of adequate, dependable fire protection apparatus for every situation.

Circle **Item 54** on Inquiry Card

(New Literature continued on page 130)

Low Water Cut-offs on Hot Water Boilers?!

...the industry has given the answer

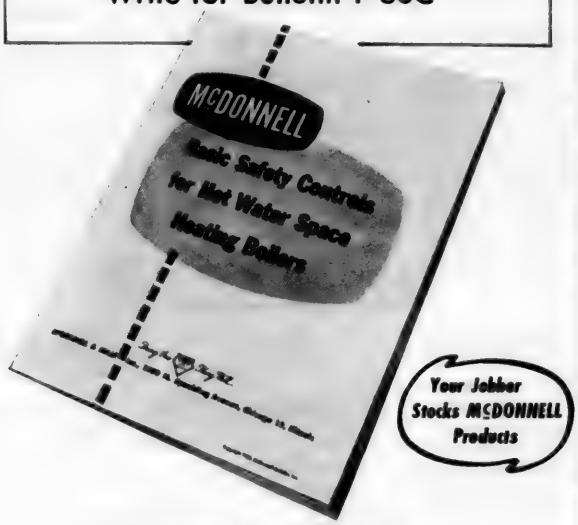
Yes, the answer has come from the field . . . from the engineers, contractors and manufacturers. They have seen the logic of installing a water level control on hot water space heating boilers . . . a low water cut-off, or—for even greater precaution—a feeder cut-off combination.

We knew it was a good idea. Expected it to grow and grow. But frankly we have been surprised at how rapidly the heating industry has taken hold of water level control as a logical team mate for an ASME pressure relief valve.

In fact, many local codes now require a low water cut-off, or feeder cut-off combination, on hot water boilers installed in places of public occupancy—including multiple dwelling units.

Notice the diagrams of recommended installations opposite. For more detailed discussion get this booklet that tells the whole story: "Basic Safety Controls for Hot Water Space Heating Boilers."

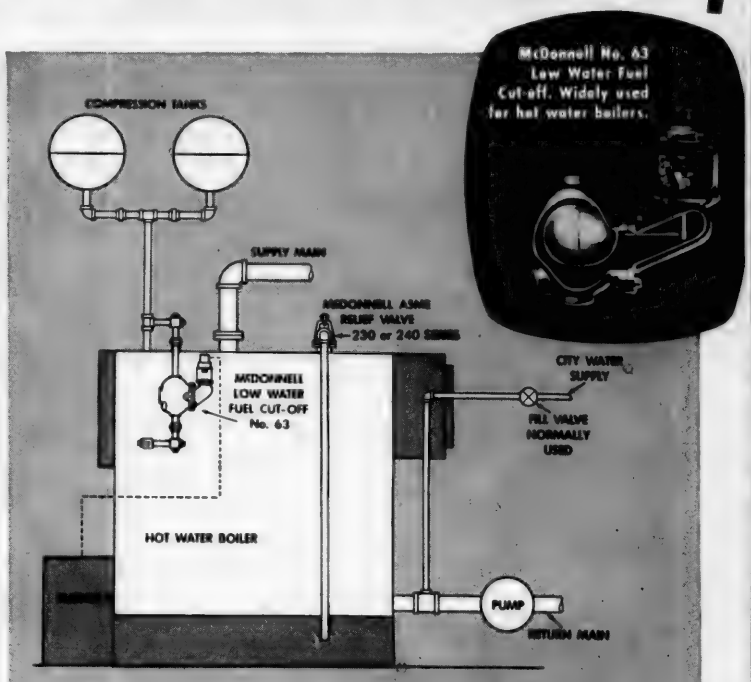
The What-Why-How in eight interesting pages
Write for Bulletin P-30C



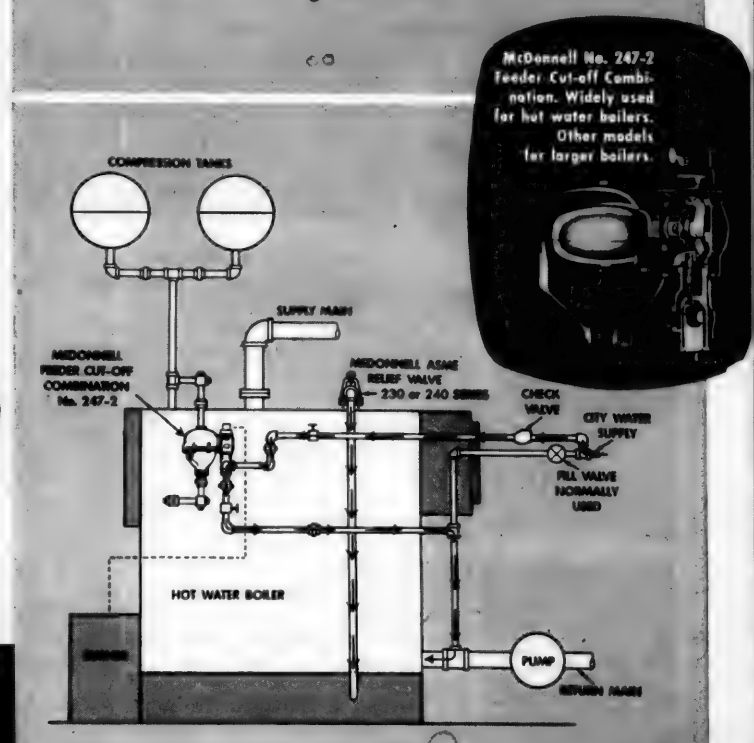
McDONNELL & MILLER, Inc.
3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

McDONNELL


McDonnell No. 63 Low Water Fuel Cut-off. Widely used for hot water boilers.
COMPRESSION TANKS
SUPPLY MAIN
McDONNELL ASME RELIEF VALVE —230 or 240 SERIES
McDONNELL LOW WATER FUEL CUT-OFF No. 63
CITY WATER SUPPLY
FILL VALVE NORMALLY USED
HOT WATER BOILER
PUMP
RETURN MAIN

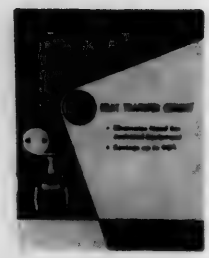
1 The essential low water control for a hot water boiler. A McDonnell Low Water Cut-off located above lowest permissable water level; also McDonnell A.S.M.E. Pressure Relief Valve.


McDonnell No. 247-2 Feeder Cut-off Combination. Widely used for hot water boilers. Other models for larger boilers.
COMPRESSION TANKS
SUPPLY MAIN
McDONNELL FEEDER CUT-OFF COMBINATION No. 247-2
McDONNELL ASME RELIEF VALVE —230 or 240 SERIES
CHECK VALVE
CITY WATER SUPPLY
FILL VALVE NORMALLY USED
HOT WATER BOILER
PUMP
RETURN MAIN

2 The safest and most complete control for a hot water boiler. Offers a combination of mechanical and electrical safeguards which is today's best and most complete answer. A McDonnell combination Boiler Water Feeder and Low Water Cut-off; also McDonnell A.S.M.E. Pressure Relief Valve.

(Continued from page 128)

Use the prepaid postcard on last page for securing your copies of these catalogs.



Heat Transfer Cement

Thermon heat transfer cement, described as eliminating need for jacketed equipment and producing savings up to 90%, is the subject of 6-page Bulletin No. 300, published by Thermon Manufacturing Co., Houston, Tex. Engineering properties and application techniques are included.

Circle **Item 55** on Inquiry Card

Aluminum Tube

A 48-page book, entitled Revere Aluminum Tube, called one of the most detailed presentations of data on aluminum tube available, is issued by Revere Copper and Brass Inc., New York, N. Y. It contains comprehensive information on tube selection factors, properties and characteristics.

Circle **Item 56** on Inquiry Card

Iron Body Gate Valves

Walworth Co., New York, N. Y., announces the publication of a new circular on standard iron body gate valves. This 5-page piece lists service ratings, sizes and dimensions, applications, and material specifications for all of the company's iron body gate valves.

Circle **Item 57** on Inquiry Card

High-Velocity Door Heaters

Door heaters to temper inrushing cold air when large outside doors are opened are described in a 2-page bulletin available from L. J. Wing Mfg. Co., Linden, N. J. Bulletin includes recommended sizes for various door sizes and expected minimum outdoor temperatures.

Circle **Item 58** on Inquiry Card

Water System Products

A 90-page general catalog covering the entire line of water system products of Red Jacket Manufacturing Co., Davenport, Iowa, is issued by that company. The catalog includes many new products, and contains an engineering section and a sales aid section.

Circle **Item 59** on Inquiry Card

Automatic Controls

Its 1959-60 catalog is announced by White-Rodgers Co., St. Louis, Mo. Listing the firm's entire line of automatic controls for heating, refrigeration, and air conditioning applications, the 56-page cross-indexed catalog describes and illustrates many new products.

Circle **Item 60** on Inquiry Card

Backwardly Inclined Blowers

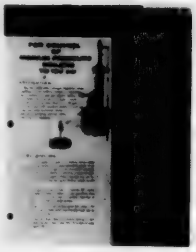
Century Fan & Ventilator Co., Inc., Stamford, Conn., announces 32-page Bulletin No. 1500 which gives engineering data and AMCA-certified ratings on the company's line of Class 1 and 2 backwardly inclined centrifugal blowers. Construction features and fan arrangements are included.

Circle **Item 61** on Inquiry Card

Compressed Air Fundamentals

Ingersoll-Rand Co., of New York, N. Y., announces a booklet, entitled Compressed Air Fundamentals, which was designed as an aid in the selection of a small packaged air compressor. Booklet describes compressed air and related equipment, and includes data on compressor oils and pipe sizes.

Circle **Item 62** on Inquiry Card



Hydraulic Damper Regulator

A catalog sheet available from Atlas Valve Co., Newark, N. J., describes the company's No. 5000 hydraulic damper regulator which also regulates fans, stokers, oil and gas control valves, and is suitable for use in boilers operating at pressures from 5 to 150 psi.

Circle **Item 63** on Inquiry Card

Two-Volume Air Delivery

A 12-page manual, from Morrison Products, Inc., Cleveland, Ohio, describes the design, installation and operation of the company's Du-Air damper control for central heating-cooling combinations. Device is an automatic two-position damper control that provides 2-volume air delivery.

Circle **Item 64** on Inquiry Card

Single-Handle Ball Faucets

Delta Faucet Corp., Greensburg, Ind., announces a comprehensive catalog, with photos and specification drawings, describing its complete line of single-handle ball faucets with only one moving part. Catalog includes new dispenser models for dispensing hand lotions and liquid soaps.

Circle **Item 65** on Inquiry Card

Steam Coils

Recold Corporation, Los Angeles, Calif., announces publication of a comprehensive steam coil catalog (51C9a). Included are tables covering circuiting selection, steam coil selection method, capacity at common steam pressures, dimensional tables, and air friction tables.

Circle **Item 66** on Inquiry Card

(New Literature continued on page 132)

"NO REJECTS IN OUR SHOP! WE CRIMP CHIP-PROOF WEIRKOTE"

See for yourself, as so many others have. Put zinc-coated Weirkote through its paces. Give it the business—the toughest, most tortuous jobs in the shop. Crimp it, bead it, twist it, spin it, draw it. Work it to the limits of the steel itself. Then take a close look.

Not a chip or flake mars its smooth zinc surface! And why should they? Weirkote's continuous process integrates zinc and steel so tightly that chipping and flaking do not occur and a new high in corrosion protection is assured.

Can you imagine what this means to repeated, top-notch production results? To the goodwill of your customers who will continually get the best finished products on the market? To your peace of mind, rid, at last, of annoying, costly rejects?

In spite of all these advantages, Weirkote's cost is low. One more good reason why you should write today for a free 12-page booklet that explains in detail how Weirkote can help you. Weirton Steel Company, **Dept. N-8** Weirton, West Virginia.

WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY

WEIRTON, WEST VIRGINIA

a division of

NATIONAL STEEL CORPORATION

SPECIFY SHOCK CONTROL by-- HYDRO Trol
HYDROSTATIC SHOCK CONTROL

Here's the Shock Control that's been designed to provide a more efficient and permanently effective method of controlling Hydrostatic Shock and eliminating Water Hammer on every Hot or Cold Water Piping System.

Designed to last the life of the piping system without failure, . . . Hydro-Trol is constructed entirely of stainless steel. Its pressurized design utilizes the cushioning effect of both hydraulic and pneumatic pressure to provide its unmatched efficiency in absorbing and controlling the pressures of Hydrostatic Shock and resulting Water Hammer under even the most extreme conditions.

Available in six sizes, Hydro-Trol offers a Simplified Sizing Method that makes it "PLUMB-EASY" to specify and install the correct size on every job.

FOR FURTHER INFORMATION WRITE FOR YOUR COPY OF SHOCK CONTROL BY HYDRO-TROL

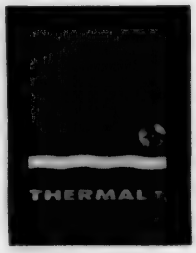
JAY R. SMITH MFG. CO. Union, New Jersey PLUMB-EASY

CHAIR CARRIERS DRAINS INTERCEPTORS

New Literature

(Continued from page 130)

Use the prepaid postcard on last page for securing your copies of these catalogs.



Fired Heat Exchangers

Bulletin No. 113, issued by Thermal Research & Engineering Corp., Conshohocken, Pa., describes various types of fired heat exchangers now available. Five standard types are presented, giving ranges of Btu per hr duty, pressure and temperature ratings, and typical pressure drops.

Circle **Item 67** on Inquiry Card

Built-Up Air Conditioners

Catalog No. AHV-59, published by Airfan Engineering Co., Los Angeles, Calif., describes the company's line of air conditioners with building block design for complete flexibility of application. Sixty-page catalog includes all engineering data necessary for selection of components.

Circle **Item 68** on Inquiry Card

Steel Scaffolds

Baker-Roos, Inc., Indianapolis, Ind., offers a 16-page bulletin describing its lightweight, high quality, alloy steel scaffolds. Bulletin gives construction features and complete specifications for the scaffolds and also for auxiliary equipment to meet special applications.

Circle **Item 69** on Inquiry Card

Rigid Plastic Pipe

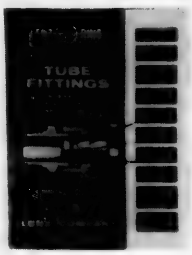
Ace-Ite, a general purpose rigid plastic pipe (Type I-ABS), is described in 16-page Bulletin No. CE-80 by American Hard Rubber Co., div. of Amerace Corp., Butler, N. J. Bulletin is exceptionally complete in technical data, covering fittings and valves as well as pipe.

Circle **Item 70** on Inquiry Card

Heat Transfer Equipment

The complete line of heat transfer equipment manufactured by Brown Fintube Co., Elyria, Ohio, is described in 4-page Bulletin No. 593. Equipment includes heat exchangers, fired indirect heaters, tank heaters, tank suction and line heaters, and packaged boilers.

Circle **Item 71** on Inquiry Card



Tube Fittings

A 24-page illustrated catalog is announced by Lenz Company, Dayton, Ohio. Each fitting in the company's complete line of tube fittings is shown in photos with pertinent specifications. Where needed, cut-aways and drawings supplement the photos. Stocking distributors are listed.

Circle **Item 72** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.

Plant Waste Disposal

Cutting of industrial waste disposal costs is theme of brochure published by Wandel Machine Co., Pomeroy, Pa. Its Somat waste disposal system takes in refuse, chews it into finely ground pulp, renders it odorless, and discharges it to haul-away containers for fast, easy disposal.

Circle **Item 73** on Inquiry Card

Control Valves

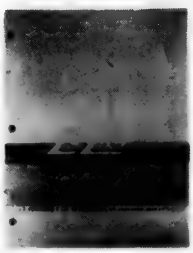
DeZurik Corp., Sartell, Minn., announces a bulletin describing its complete line of control valves. Identified as Bulletin 150, the publication lists valve bodies and actuators, and the accessory line available for the control valves. Valve sizing data are also included.

Circle **Item 74** on Inquiry Card

Products for Air Conditioning

A complete line of products for air conditioning and refrigeration work is described in a 40-page catalog available from The Imperial Brass Manufacturing Co., Chicago, Ill. Catalog No. 82 includes Freon hose and couplings, fittings, valves, driers, and tubing tools.

Circle **Item 75** on Inquiry Card



Tapered Cooling Tower

Bulletin 51-902 describes the Keystone Lo-Line tapered cooling tower manufactured by J. F. Pritchard & Co. of California, Kansas City, Mo. The 4-page bulletin includes construction features, capacity tables, and suggested specifications for the cooling tower.

Circle **Item 76** on Inquiry Card

Refrigerant Data

A 4-page data sheet for Ucon Brand refrigerants is announced by Fluorocarbons Div., Union Carbide Chemicals Co., div. of Union Carbide Corp., New York, N. Y. Physical, chemical, and performance characteristics, plus vapor pressure, are given for five refrigerants (11, 12, 22, 113, 114).

Circle **Item 77** on Inquiry Card

Make-Up Air Systems

Bulletin EN-5911, from Reznor Manufacturing Co., Mercer, Pa., describes how make-up air properly introduced and tempered will overcome negative air pressure and eliminate its attendant problems. Bulletin outlines the design of a make-up air system, simplifies equipment selection.

Circle **Item 78** on Inquiry Card

JACK HAMMER FAILS TO FLAKE INLAND TI-CO®

Crumbling concrete is easy with this powerful paving breaker. It hits with crunching impact at the rate of 1,200 blows per minute with 75,000 ft. lbs. of developed energy. Yet, while thousands of repeated blows actually hammered this TI-CO galvanized sheet into the ground at the point of contact, there wasn't a trace of flaking of the zinc coating!

TI-CO won't flake or peel on the job, either. It's soft enough to take the most complicated forming, and when you hammer it flat it doesn't spring back—it stays flat!

TI-CO sheets take Pittsburgh lock-seaming or any other tough fabricating process without your worrying about make-overs. You get a good-looking, long-lasting installation . . . every time!

Ask your Steel Service Center for the TI-CO Brand . . . the galvanized sheet that's tailor-made for sheet metal work.

INLAND TI-CO

AMERICAN STEEL WAREHOUSE ASS'N

INLAND STEEL COMPANY

30 West Monroe Street · Chicago 3, Illinois

It's the Sterlco®

THERMOTROL

for ACCURATE, INDEPENDENT ROOM TEMPERATURE CONTROL

STEAM or HOT WATER SYSTEMS

for new construction

CAN BE KEY LOCKED

for ...
HOSPITALS, APARTMENTS, OFFICES, HOTELS, SCHOOLS, MOTELS, INSTITUTIONS and PUBLIC BUILDINGS

- **COMPLETELY SELF-CONTAINED**
  Each Sterlco Thermotrol is a complete temperature control unit, easily installed in any two-pipe system in place of the manual valve. NO wiring or other external connections needed.
- **MODULATING CONTROL—NOT *on* AND *off***
  Each Sterlco Thermotrol provides steady, even control to each radiator the way YOU want it. Radiators in cold spots give off heat while those in warmer parts of the same room are automatically throttled down.
- **NO ELECTRICAL CONNECTIONS**
  No electric wiring, additional piping, or other connections are required with the Sterlco Thermotrol. Just as easily installed for modernization as for new construction.

FOR BUILDING MODERNIZATION

With a Sterlco Thermotrol on each radiator, stuffy overheated rooms, open windows, and excessive fuel bills are eliminated. You pay for only the heat you need . . . rooms are comfortably, evenly warm . . . occupants comfortable.

FOR NEW CONSTRUCTION

Here's modern ZONE CONTROL for radiant systems. The only modern solution to inefficient "on-off" valves and expensive, motorized valves.

STEAM HEATING IS MODERN, EFFICIENT and DEPENDABLE
Sterlco Products Distributed through
LEADING HEATING and PLUMBING WHOLESALERS

STERLING, INC.
2200 W. Clinton Ave. Milwaukee 13, Wis.

CONDENSATION AND VACUUM PUMPS | HEATING SPECIALTIES | TEMPERATURE CONTROLS

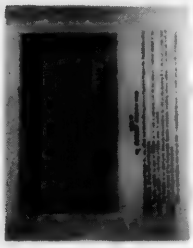
New Literature

Use the prepaid postcard on last page for securing your copies of these catalogs.

Curtain Wall System

A 12-page booklet introduces Thinlite, the modular curtain wall system with built-in daylight control manufactured by Kimble Glass Co., an Owens-Illinois subsidiary, Toledo, Ohio. Booklet gives typical details, sizes, specifications, and other technical data, including solar heat gain.

Circle **Item 79** on Inquiry Card



Oil and Gas Burner

A 6-page folder on its mechanical pressure atomizing oil and nozzle-mix gas burner is published by Boiler Engineering & Supply Co., Phoenixville, Pa. Drawings show construction features and principle of operation of combination burner with which Continental package boiler is equipped.

Circle **Item 80** on Inquiry Card

Btu Metering for Shopping Centers

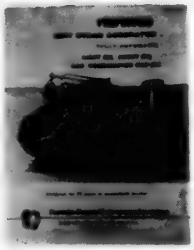
An 8-page brochure, entitled Modern Shopping Centers and Btu Metering, is offered by Air Conditioning Equipment Corp., New York, N. Y. It describes a large installation of Pollux Btu meters for accurately billing heating and cooling charges in a central system.

Circle **Item 81** on Inquiry Card

Steel Classroom Equipment

Complete descriptions, illustrations and specifications of the company's line of steel classroom equipment are included in a 6-page catalog released by Grade-Aid Corp., Nashua, N. H. Equipment includes sink units, wall units, counter storage units, and wardrobe and storage units.

Circle **Item 82** on Inquiry Card



Unit Steam Generator

Literature describing the company's fully-automatic unit steam generator is available from Preferred Utilities Manufacturing Corp., New York, N. Y. Included are construction features, steel specifications, and other engineering data for the gas and/or oil burning unit.

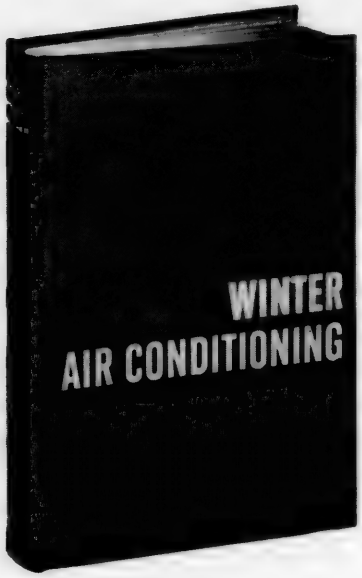
Circle **Item 83** on Inquiry Card

Solenoid Valves

Atkomatic Valve Co., Indianapolis, Ind., offers Catalog No. 444 listing its complete line of solenoid valves for use with air, steam, corrosive and non-corrosive gases and liquids. The 36-page catalog gives valve specifications, performance data, and specific application information.

Circle **Item 84** on Inquiry Card

WINTER AIR CONDITIONING



THE COMPLETE AUTHORITY ON RESIDENTIAL HEATING

by Seichi Konzo

J. Raymond Carroll

Harlan D. Bareither

Mechanical Engineering Department, University of Illinois

This is a basic text on design, installation, and operation of residential heating systems. Written as a self-study or classroom training text, with problems and solutions for each chapter, it is also a complete working reference book for contractors, sales engineers, students and trainees. The authors are on the staff of one of the world's foremost centers for home-heating research. They have written the *why* and *how* of residential heating in terms that need no more than ordinary knowledge of arithmetic.

$8.00

640 pages

300 illustrations

Fully Indexed

CONTENTS

Temperature, Humidity, Wind and Sun
Wet and dry-bulb—Dew Point—R. H.—Humidity control—Wind and sun effects

Heat Transfer and Comfort Standards
Body reactions—Comfort—Heat flow—Radiation, conduction, convection—Standards

Reading and Drawing Heating Plans
Making a floor plan—Tracing from blueprints—How to use plans—Symbols and abbreviations

House Construction
Sills and girders—How they affect heating—Types of construction—Moisture Control—Insulation—Venting—Chimney draft

Calculating Heat Losses
Design temperatures—How to measure house — Infiltration — Sample calculations —Losses

Heat Generation
Fuels — Burners — Degree-days — Seasonal costs—Combustion losses—efficiency

Boilers and Furnaces
Testing and rating—How to select a boiler —Selecting a forced air furnace

Radiators and Convectors
Radiation (emissivity) from surfaces—Convection — Radiators — Enclosures — EDR—panels

Steam Heating Systems
Pressure and temperature of steam—Heat content — Piping — Venting — Operation —Safety

Hot Water Heating Systems
Gravity—Pump performance—Pressure—Head loss—Piping layouts—Flow control —Design

Gravity, Warm Air & Heating Systems
Development—Performance—Duct Design —Selection and Location of Furnaces

Forced Warm Air and Heating Systems
Blower Cabinets—Power requirements—Ratings—Duct Resistance—Fittings—Air Distribution

Design of Forced Warm Air Systems
Pressure Loss — Sample Calculations — Floor slabs — Perimeter System — Duct Layout

Modulated Heat Delivery
Varying Heat Delivery with Weather — Continuous Operation — Controls — Vacuum Steam Systems — Hot Water Systems — Zone Controls — Multiple Heating Units

Trends and Developments in Heating
Energy Sources for the Future—Electric Resistance Heating—Heat Pumps—High Temperature Water — District Steam — High Velocity Air

Companion Volume to the Popular

SUMMER AIR CONDITIONING

by the same authors — $8.00

Combination price, set of both books — $15.00

Use coupon below or circle letter U on prepaid order card inside back cover

THE INDUSTRIAL PRESS, 93 Worth St., New York 13, N. Y.

——— Please send me SUMMER AIR CONDITIONING @ $8.00

——— Please send me WINTER AIR CONDITIONING @ $8.00

——— Please send me both books at $15.00 per set

——— Payment enclosed, send book(s) postpaid

——— Send book(s) and invoice, including 15c postage and handling charges

—— Bill me —— Bill company

Name .....

Company and Address .....

City .....Zone .....State .....

Home Address .....

(Please fill in last line above only if you want book sent to your home)

ACHV-10/59

Things to Think About in Selecting Sidewall Diffusers

...aspiration, aspect ratio, noise levels, smudging, and other factors

A sidewall diffuser has three basic functions to perform:

1. Attractively cover the duct opening in the wall.
2. Impart direction to air flow.
3. Diffuse the conditioned air thoroughly and rapidly before it reaches the occupancy zone.

If a "diffuser" doesn't truly diffuse, it can drop a solid mass of cold air onto occupants of the room. One way to get around this problem is to direct the air flow from the diffuser toward an unoccupied area of the room. Another method is to use ceiling diffusers even when sidewall diffusers would be easier and more economical to install. Neither solution is ideal.

The Answer

Barber-Colman Uni-Flo sidewall diffusers provide an efficient answer to the problem. They provide very thorough aspiration. A turbulence is created which keeps the cooled air above the occupancy zone for the full length of throw. Conditioned air literally "trickles" into the room. Rapid warmup is secured. There is no mass of cold air to disturb human comfort.

The requirements outlined in this quote are from Heating, Ventilating, Air Conditioning Guide, '58, chap. 30:

"The air discharged from a wall outlet should not reach the occupied zone until the velocity has fallen to about 50 fpm. Therefore, the outlets should be located high enough for the air stream at the termination of throw to be not less than five or six feet above floor level. Or, in other words, the drop should not be more than the difference between mounting height and zone of occupancy."

Fig. 2 Barber-Colman Uni-Flo Sidewall Diffuser — Note grille design which creates controlled air turbulence for complete aspiration.

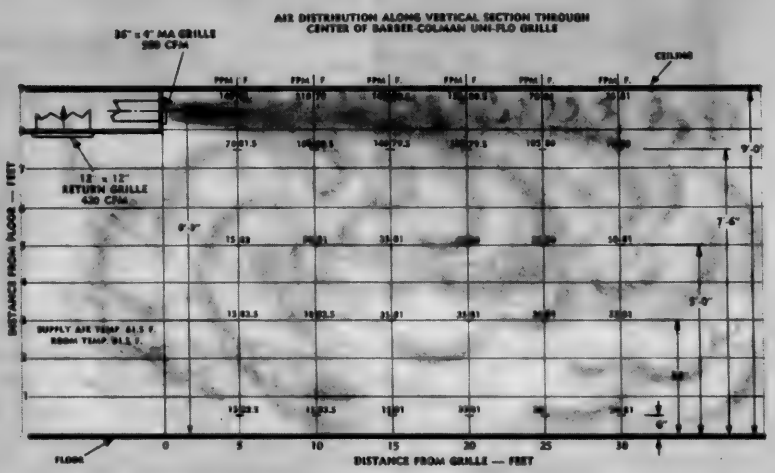

AIR DISTRIBUTION ALONG VERTICAL SECTION THROUGH CENTER OF BARBER-COLMAN UNI-FLO GRILLE
CEILING
12" x 12" RETURN GRILLE 430 CFM
DISTANCE FROM FLOOR — FEET
DISTANCE FROM GRILLE — FEET
FLOOR

Fig. 1 Uni-Flo Grille Traverse — This charts the results you can predict and deliver with Uni-Flo grilles. Only Uni-Flo grilles are true sidewall diffusers guaranteed to perform in accordance with the published data.

It is almost impossible to meet this requirement in a low-ceilinged (9 ft) room without the aspiration provided by Barber-Colman Uni-Flo sidewall diffusers.

Fig. 2 shows how the grille of the Barber-Colman Uni-Flo sidewall diffuser is designed to create air turbulence. This is in direct contradiction to the theory of using "air foil" sections (which create a laminar flow which tends to defeat aspiration and to drop air into the occupancy zone as discussed above).

There is another very nice feature about the Uni-Flo grille design. Not only does it provide for adjustment of horizontal flow, it also provides controlled adjustment in vertical planes. This permits you to steer the air past any obstacles in front of the grille.

Noise Levels

The effect upon noise level of the air turbulence created by Uni-Flo sidewall diffusers is sometimes asked about. Page 7 of Barber-Colman "Grille Engineering Data" contains a listing of noise levels for various air patterns. These figures speak for themselves, showing that there is no noise problem. Incidentally, Barber-Colman offers the most complete diffuser noise level data available, including the effect of dampers in various positions.

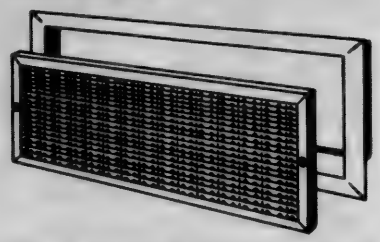


Fig. 4 Removable cores — to simplify installation and maintenance and contribute to good housekeeping.

Aspect Ratio

The aspect ratio of Uni-Flo grilles has a very definite effect on their performance, even though aspect ratio may not matter with other types of diffusers. It assists the excellent aspiration achieved by Uni-Flo diffusers and, therefore, assures more even air distribution throughout the room.

Another feature of Uni-Flo grilles is the removable core which contributes to good housekeeping. The core can be removed without damaging the paint seal around the frame. Also, electroplated cores are available (in

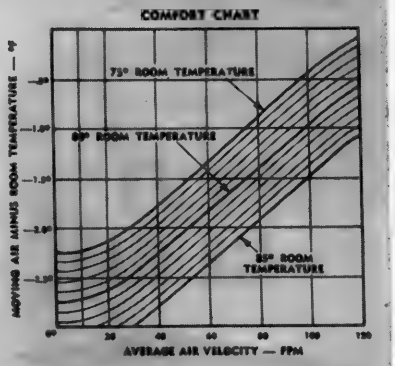


Fig. 3 Barber-Colman Comfort Chart — Here are the conditions of air movement and temperature in the occupancy zone that are required for human comfort standards. All points below the line represent uncomfortable conditions, while those above the line fulfill the requirements. You get required performance with Barber-Colman Uni-Flo sidewall diffusers.

which case the frames are painted to match the wall). Electroplated cores are less conspicuous and more durable and can be easily cleaned.

Accessories

Simple, positive, tamperproof adjustment of the air volume for easy system balancing is provided by the optional Uni-Flo opposed-blade volume control. Although normally key-operated, this can be furnished with an operating knob. Its opposed-blade design prevents any shifting in the damper setting. Deflectrols — factory-assembled deflecting vanes — attached to the rear of the diffuser provide uniform distribution across the diffuser face.

Performance

Barber-Colman diffusers will meet the following specification:

Sidewall and/or ceiling air distribution grilles and diffusers will diffuse air uniformly throughout the conditioned space, but at no point in the occupancy zone will the air velocity exceed 30 fpm at a temperature more than 2° F below the average room temperature or 75 fpm at a temperature more than 1½° F below the average room temperature.

Engineering Data Catalog No. F-4051-2 gives complete information, including 50 pages of selection data which provides all of the information necessary for even the most difficult jobs. Call your local Barber-Colman office or write to:

BARBER COLMAN

BARBER-COLMAN COMPANY

Dept. V, 1102 Rock Street, Rockford, Illinois

WESTERN SHOW

(Concluded from page 14)

the Western Air Conditioning Industries Association. Fred J. Tabery, 3443 South Hill Street, Los Angeles 7, is exhibit manager and is now assigning space to exhibiting firms.

An *Engineers' Day* will include a clinic for junior engineers on fan auxiliary equipment, with emphasis on selection of fan drives, electric motors, motor starters, and vibration control. Senior engineers will attend a conference on specification writing.

Contractors' Day will have a technical session for plumbers on connections for steam and hot water boilers, a sheet metal contractors' session on high velocity systems, an air conditioning contractors' clinic on temperature control systems, and a refrigeration contractors' symposium on condensing methods.

Journeyman's Day will feature four sessions as follows: for piping men and plumbers—piping; for sheet metal men — testing and balancing; for power engineers—condenser and boiler maintenance; for refrigeration men—defrosting methods.

Five important meetings for an interested public, Mr. Hess says, have been arranged. They are: hospitals—control of air borne infections; schools—what not to do in preparing for future air conditioning; office structures — lighting load versus air conditioning; hotels — ventilation's importance as a part of air conditioning; residential—heat pumps.

Educational exhibits, Mr. Tabery reports, will fill the ground and lower levels of the huge exhibition hall. He pointed out that Southern California's coastal and desert areas are applying air conditioning on an ever increasing ratio. For this market, he is confident the exhibit will be an effective force in introducing to it many new developments.

NEW ASSE HEADQUARTERS

established in Cleveland will be focal point of Society activities. Office to be under the supervision of its newly elected Secretary.

The American Society of Sanitary Engineering has established central headquarters at 228 Standard Building, Cleveland 13, Ohio. The office, under the supervision of the new Secretary, Sanford Schwartz, will serve as a focal point for all Society records and activities.

This move, the Society feels, represents a tremendous stride forward in its operation and prestige. In one head office will be centered all the business of the Society, formerly consisting of that of the Secretary and the Publicity, Publication, and Newsletter committees.

With the prestige of a centrally located office to which anyone can refer on any subject with respect to its activities, the ASSE sees itself approaching the status of any of the large industrial associations in any field.

Several activities will be pursued more concentratedly in the near future, ASSE states. There will be established a central library which will contain all reports of all Society activities. This will be available for personal examination or can be requested by mail at all times. There has been established a central file for keeping the minutes of all chapters, so that this information will be preserved for all time.

For the first time in its history, ASSE mailing lists are centrally located, automatically kept up to date. In the past it has been necessary to keep the treasurer, the publication office, and the mailing divisions advised on all changes in names, addresses, new members, suspensions, and other administrative matters.

With all information coming into a central source, the Society looks forward to a considerable stepping up of the group's time schedules on many of its projects. Activities which in the past have been contemplated and which it was unable to develop, now enter the planning stage.

for FUME

CONTROL

install

FLEXAUST®

HOSE

Made of strong neoprene coated cotton or nylon fabrics spiral wire reinforced.
For *all* kinds of fume and dust control, and ventilation uses.
Extremely flexible, durable, and lightweight.
Exceptionally easy to cut, install, connect, reuse, and relocate.
Sizes 1¼" thru 36" i.d.

Write for details today
Distributors
in all principal cities

THE FLEXAUST COMPANY
Dept. HV-10
NEW YORK

BRIEFLY STATED

NEWS ITEMS

The MECHANICAL CONTRACTORS ASSOCIATION OF AMERICA named Thomas J. Ryan, former special assistant to the General Counsel of the National Labor Relations Board, to the position of executive secretary. His office is in New York national headquarters. Mr. Ryan, a Columbia Law School graduate, is said to be exceptionally well qualified to assist the Association in the formation of policies pertaining to labor-management relations and proposed legislation affecting the industry.

WITH THE ENGINEERS

Ernest F. Siegel has been named an associate by the consulting engineering firm of GREEN ASSOCIATES, INC., Baltimore, Md. Mr. Siegel, with the firm since 1953, is in charge of the mechanical and electrical departments. . .

Donald A. Booth is appointed engineering manager for ENGINEERING WORKS DIV., DRAVO CORP., Pittsburgh, Pa. He had been assistant engineering manager for the past year. He will supervise design and engineering of a multitude of specialized machinery and process equipment manufactured by the Division, among which are space heaters, vibrating screens, feeders, and conveyors.

INSTITUTES AND ASSOCIATIONS

A COMMERCIAL - INDUSTRIAL ASSOCIATES UNIT has been established as an integral part of OIL-HEAT INSTITUTE OF AMERICA, New York, N. Y. The new unit of the Commercial-Industrial Section of OHI provides an authorized industry trade association for all franchised enterprises dealing in services and installation of commercial and industrial fuel burners and accessories. The C-I Associates group will work closely with manufacturers. It provides a forum in which the installer or distributor can be heard on matters including design,

(Continued on page 140)

for dependable, low-cost air cleaning...

SPECIFY AIR-MAZE

FILTER PANELS

Types Available

- Dry, Washable
- Oil-Wetted
- Greastop®

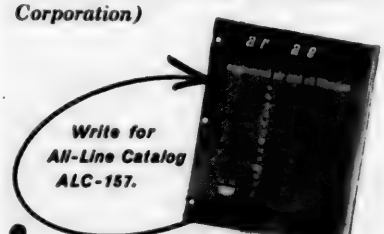
ROTATING PANEL CURTAINS

- Self-cleaning Automaze

ELECTRONIC AIR CLEANERS

- High Velocity Electromaze

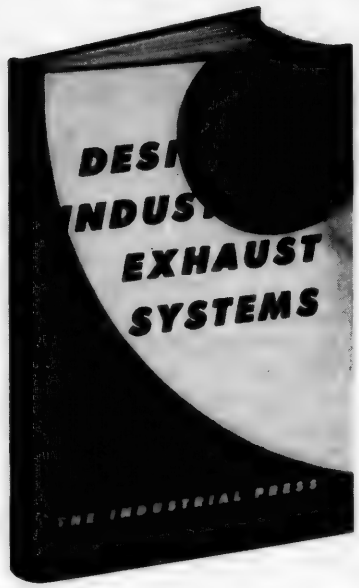
Plus, a complete line of dry, oil bath and oil-wetted type air filters and air filter silencers for air intakes of air compressors and engines. *Air-Maze Corporation, Department AC-10, Cleveland 28, Ohio. (Subsidiary of ROCKWELL-STANDARD Corporation)*



AIR-MAZE
The Filter Engineers

AIR FILTERS • SPARK ARRESTORS • LIQUID FILTERS
SILENCERS • OIL SEPARATORS • GREASE FILTERS

THIS MODERN ENGINEERING TEXT TELLS YOU HOW TO DESIGN, BUILD OR BUY INDUSTRIAL EXHAUST SYSTEMS



Revised, Expanded, Up-to-Date Third Edition of Standard Reference

John L. Alden's classic text on designing, building and buying industrial exhaust systems has been brought up-to-date to meet modern standards of industrial environment. This new edition takes note of the strides made in the variety and quality of devices and techniques. Among the new advances and developments it treats are: fog filters, reverse flow filters, venturi scrubbers and multiple miniature cyclones.

Both a modern engineering text and a practical guide for contractors, building owners, hygienists—this book is the ideal source of information for anyone concerned with the industrial environment. Typical of its practical value are the drawings and detailed specification for hoods serving a wide variety of industrial situations. And it demonstrates the use of data and design principles with an example of how to design a system.

$6.00

256 Pages

137 Illustrations

To order, use coupon below or circle letter E on postcard, last page

CONTENTS

Flow of Fluids—
Conveying Fluid • Standard Air • Compressibility • Suspended Solids • Static, Velocity, Impact Pressures • Bernoulli's Theorem • Critical Velocity • Empirical Formulas • Reynolds Number • Turbulent Flow • Pipe Friction • Velocity Distribution • Flow of Mixtures.

Hoods for Dust Control—
Hood Types • Machine Hood Design • Dusts • Hazards • Dispersion • Suction Openings • Hood Contours and Characteristics • Flanged Hood Faces • Adjacent Planes • Coarse Particles • Typical Exhaust Hoods.

Hoods for Fume, Smoke and Vapor Control—
Canopy and Double Hoods • Face Velocities • Multiple Suction Connections • Semi-Canopies • Rear Hoods • Lateral Tank Exhaust • Slot Velocities • Blow-and-Exhaust Hoods • Booths • Bench Hoods • Foundry Shake-Outs • Welding Fume Control.

Air Flow Through Hoods—
Velocities at Dust Sources • Exploring Hoods • Hood Face Velocities • Pipe Sizes and Hood Suction • Air Volume • Coefficient of Entry • Orifices and Nozzles • Static Pressures • Suppressed Contraction • Flow Calculations • Increasing Flow.

Pipe Resistance—
Conveying Velocity • Friction Loss in Rectangular Pipes • "Velocity Head Rule" • Friction Loss in Hose • Elbows • Aspect Ratio • Angle of Turn • Approach Velocity • Compound Elbows • Venturi Elbow • Equivalent Orifice • Enlargements • Tapers • Contractions • Tees • Breechings.

Piping Design—
Procedure • Data Sheets • Calculation of Typical Piping System • Increasing Hood Suction • Piping Fallacies • Design of Purchased Systems.

Dust Separators—
Characteristics • Efficiency • Discharge • Mechanics • Size • Gravity Chambers • Settling Chamber Velocities • Resistance • Vortical Flow Through Cyclone • Factors Affecting Separation • Angular Travel • Application of Cyclones • Pressure Drop Through Cyclones • Low-Loss Cyclones • Cyclone Shapes • Tangential Cyclones • Cyclone Inlets and Outlets • Cyclones in Tandem • Dust Bins • Axial Flow and Inertial Separators • Scrubbing Towers • Venturi and Cyclone Scrubbers • Filters • Electrostatic Precipitaters • Individual Exhaust Units.

Low Pressure Conveyers—
Conveying Velocities • Volume Required • Suction vs. Pressure Systems • Unloading and Feeding Devices • Venturi Tube Theory • Typical All-Pressure Conveying System • Tandem Fans • Economic Pipe Sizes • Relay Systems.

Centrifugal Exhaust Fans—
System Pressures • Fan Rating Pressures • Power Consumption • Performance Curves • Effect of Speed and Size on Fan Characteristics • Fan Types • Drives • Noise and Vibration • Dust-Separating Fans.

Axial Flow Fans—
Propeller, Tubeaxial, Vaneaxial Fans • Representative Installations • Drives • Characteristics • Sound Level • Axial Flow vs. Centrifugal Fans.

Structural Details and System Planning—
Tapers • Elbows • Tees • Equalizers • Blast Gates • Joints • Cleanouts • Dampers • Switches • Pipe Supports • Fire and Explosion Hazards • Ejector Systems • Self-Clearing Mains • Makeup Air.

Field Measurements and Their Interpretation—
Manometers • Impact Tubes • Pitot Tubes • Anemometers • Estimating Rate of Flow • Measuring Hood Coefficients • Flow Direction Finder • Tests to Establish Conveying Velocities • Locating and Diagnosing Trouble • Power Requirements • Power Reduction.

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

Please send me ..... copies of Design of Industrial Exhaust Systems.

☐ Check or money order is enclosed. Send book(s) postpaid. Foreign orders—except from Canada—must be accompanied by payment in full, including 50c postage charges per book.

☐ Send book(s) and invoice, including postage. I will pay within five days if I decide to keep the book(s).

☐ Bill me ☐ Bill company

Name .....

Company .....

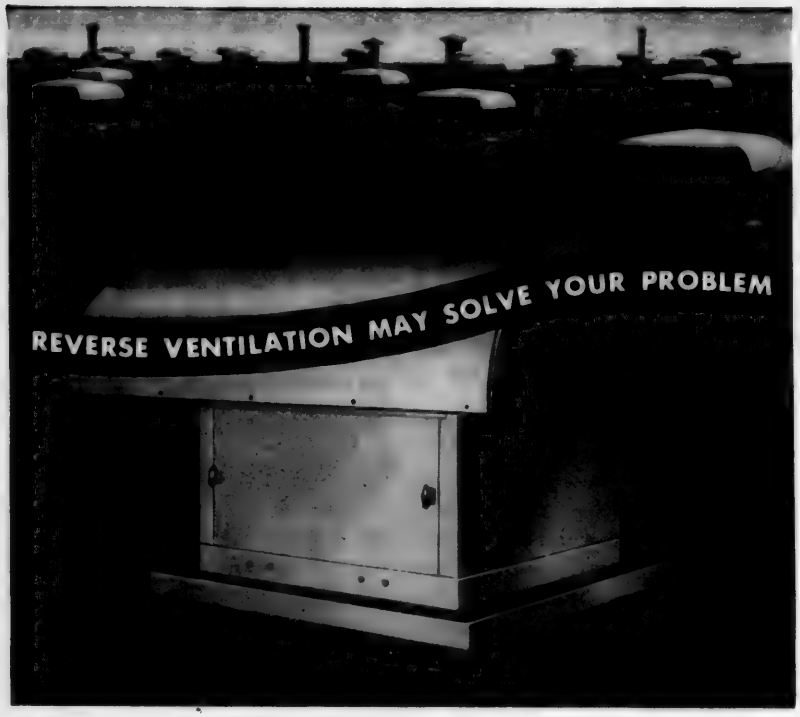
Company Address .....

City ..... Zone .... State .....

Home Address .....

(Please fill in if you want book sent to your home)

ACH&V-10/59



Burt Low Type Ventilators, Supply and Exhaust Air for Aluminum Co. of America

Blow Down Fresh Air to Blanket Floor Area

Wide, low-roofed, modern single-story plants are often difficult to ventilate properly with conventional methods. Perimeters are comfortable but other areas may not be.

Aluminum Company of America's new Screw Machine Products Plant at Lancaster, Pa., with neither cross ventilation nor natural ventilation, solved this problem with "reverse" ventilation. Forty-nine 48" all aluminum Burt Low Type Roof Ventilators maintain a year-round pleasant working atmosphere.

Twenty-five of the Burt Ventilators operate in *reverse* to blow a blanket of fresh air over the entire working floor. Adjustable diffusers circulate the air at floor level to meet seasonal needs. Strategically located over various hot areas, these Burt supply ventilators need no long horizontal duct runs to reach air intakes on outside walls.

The other twenty-four Burt ventilators exhaust the considerable heat and oil mist from production operations. *The cost of these Burt units was less than one-fourth that of a centralized duct system.*

For fresh air at low cost in your plants, why not investigate Burt's complete line of modern, efficient roof ventilators now!

Send for **FREE** *Data Book!*

Write for Burt Data Book SPV-101-G.
It supplies quick data on Burt's complete line of modern Roof Ventilators.

FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

49 E. South St. Akron 11, Ohio

MEMBER AIR MOVING & CONDITIONING ASSOCIATION, INC.

Briefly Stated

(Continued from page 138)

distribution, engineering standards, codes, and installation practices. Milton T. Way, president of Ray Burner Sales, Inc., Long Island City, N. Y., is chairman of the Associates group. . .

Appointment of Warren L. Bouve to the newly-created position of secretary, ARI Product Sections, was announced by AIR-CONDITIONING AND REFRIGERATION INSTITUTE, Washington, D. C. Mr. Bouve will be responsible for arranging meetings of, preparing agendas for, meeting with, and preparing minutes of meetings of ARI's fourteen product-sections, working directly with the managing director, Geo. S. Jones, Jr. . . .

Michel Feuche, space and research analyst, has joined the technical staff of BUILDING RESEARCH INSTITUTE, Washington, D. C., as an assistant to Harold Horowitz, assistant director for technical programs. Mr. Feuche was born in France and educated in Canada and the United States. With BRI's rapid growth and development it is called on to meet an increasing demand for reviewing and abstracting building science publications originating in foreign countries, and Mr. Feuche will digest French and Spanish reports as well as help to develop BRI technical programs and publications. . .

Thomas F. McCarthy, formerly chief inspector of plumbing for the Bronx Borough office of the Department of Buildings, City of New York, has joined the staff of the COPPER & BRASS RESEARCH ASSOCIATION, New York, N. Y., as field representative for the eastern and New England states. Mr. McCarthy was a New York City licensed plumber and was engaged in business as a plumbing and heating contractor before joining the Bronx Building Department in the Spring of 1940. He is a past president of the New York State Chapter of the American Society of Sanitary Engineering, and is a co-chairman of the Inspectors' Refresher Course, a feature of the Annual meetings of the Society. . .

Briefly Stated

The Federation of British Industries, with the backing and support of the British government, will hold a seventeen-day BRITISH EXHIBITION of industry, technology, science, and culture in the New York Coliseum next June 10 to 26. Included will be the biggest and most complete display of the British air conditioning industry ever shown in the United States, exhibition officials state. . .

Association offices of COOLING TOWER INSTITUTE have been moved from Palo Alto, Calif., to 1120 West 43rd, Houston 18, Tex. Operation of CTI programs will continue in the areas of research and publication of industry standards under the direction of James L. Willa, CTI manager. CTI represents manufacturers of industrial water-cooling towers. In addition to industry standards on acceptance test procedure, redwood lumber specifications and design data, nomenclature and wood maintenance, CTI has recently published new standards on Douglas fir lumber specifications and design data, pressure preservative treatment of cooling tower lumber, recirculation, application of recirculation factors, and gear speed reducers, all of which are available at nominal cost. . .

William Gillett, vice president of Fenestra, Incorporated, has been reappointed to a second term as chairman of BUILDING RESEARCH ADVISORY BOARD, Washington, D. C. Serving his second term as vice-chairman will be Richard H. Tatlow III, president of Abbot, Merkt & Company. BRAB also announced the appointment of six new members to its Board. Included is Peter B. Gordon, vice-president, Wolff & Munier, and president of the John B. Pierce Foundation.

* * *

At the September membership meeting of the PLUMBING BRASS INSTITUTE, O. R. Stackbein, chairman of the Nation-Wide Committee on Import-Export Policy, took exception to opinions attributed to Henry Kearns, Assistant Secretary of Commerce, that American exports will rise and that the United

The Cambridge AEROSOLVE® Filter is the RELIABLE Filter

- **High Efficiency**
- **Positive Filtration**
- **Low Pressure Drop**
- **Easy Installation & Maintenance**
- **High Velocity — 450 FPM**
- **Expert Technical Assistance**

Cambridge AEROSOLVE Filters do not depend on electric power — there is no chance of failure — no chance of breakthrough. The more loaded with dirt they become, the more efficient they become. This is really *Positive Filtration* — Safe, dependable!

Available in choice of three interchangeable cartridges of 95%, 85% and 35% efficiency, discoloration test with atmospheric dust.

Write for Bulletin 132

Cambridge Filter Corporation
734 E. Erie Blvd., Syracuse 1, N. Y.

Pioneers in High Efficiency Air Cleaning

REPRESENTATIVES IN PRINCIPAL CITIES

DRY and CLEAN AIR at the RIGHT TEMPERATURE

- to control your product quality
- to protect a critical operation
- to protect apparatus from moisture damage
- to DRY your material or product
- to control packing or storage conditions
- to assure precision in testing or research
- to increase air conditioning capacity

Air Condition by the NIAGARA Method Using HYGROL Liquid Absorbent

This compact method, giving high capacity in small space, removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the air.

Most effective because... it removes moisture as a separate function from cooling or heating and so gives a precise result, and always. Niagara machines using liquid contact means of drying air have given over 20 years of service. The apparatus is simple, parts are accessible, controls are trustworthy.

Most reliable because... the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions... no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

Most flexible because... you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Write for Bulletins 112 and 131 and complete information on your air conditioning problem.

NIAGARA BLOWER COMPANY

Dept. HV-10, 405 Lexington Ave., New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

NEW

VM

neoprene-in-shear

"R" SERIES

SFNC

SPRING-FLEX MOUNTINGS

REDUCE NOISE ABSORB VIBRATION

Control noise and vibration in fans, pumps, air conditioning machines, etc. with these new VM Vibration Mountings, made with tough, absorbent neoprene!

NEW "R" SERIES Mountings of bonded neoprene-in-shear molded in five degrees of rubber hardness for maximum deflection within each load range: 10 to 4000 lbs. Five colors to identify capacity, simplify stocking, prevent installation errors.

SFNC SPRING-FLEX Mountings combine neoprene with chrome-vanadium steel for applications requiring up to 1.25" static deflection. Neoprene stabilizers for lateral control. Leveling bolts. Non-skid neoprene acoustical pad. Capacities: 50 to 5000 lbs. (Special units for higher loads made to order.)

Write for descriptive catalog sheet and Vibration Engineering Data Sheet on noise and shock control for fans, air conditioning, cooling towers, pumps, and refrigeration equipment of leading manufacturers.

VIBRATION MOUNTINGS, INC.

98-33 50th Avenue, Corona 68, N. Y. • "phone:" Hickory 6-2370

Representatives in Principal Cities of U. S. & Canada

Briefly Stated

States has not priced itself out of foreign markets. Mr. Stackbein told PBI members that the "facts will not be vaporized by glib assurances that America's world trade problems are temporary and abnormal." Most of the pointers indicate otherwise. During 1958, he said, exports declined 16%. Imports have reached a record high this year. His answer: flexible use of tariffs and quotas by which "suitable shares of our market can be opened to imports while reserving the remainder for us."

NEW REPRESENTATIVES

Six appointments of authorized distributors for its line of welding fittings, flanges, and other piping components are announced by TUBE TURNS DIVISION OF CHEMETRON CORP., Louisville, Ky. They are Longhorn Supply Co., Inc., of Houston, and Star Corp., of Freeport, Tex., Eastern Pennsylvania Supply Co., Inc., Wilkes-Barre, Pa.; Empire Machinery & Supply Corp., Norfolk, Va.; John Hack Co., Woodbury, N. J.; and The Speakman Co., Inc., Wilmington, Del. . .

In the Southwest Texas sector, the presentation and sale of West Coast manufacturer DRAYER-HANSON'S lines of commercial and industrial air conditioning equipment will be vested with a newly-appointed sales agent group — the R. S. Ryden & Company out of San Antonio. The appointment brings to four the sales agent firms maintained in Texas by the Los Angeles manufacturer. The others are Joiner-Meade-Capers, Inc., out of Dallas; Buck Cunningham Company, Inc., Fort Worth; and Herlin Engineering Company, El Paso. . .

MODINE MANUFACTURING CO., Racine, Wis., announces appointment of Staup & Harris Associates, Inc., to represent them in the Chicago sales territory. D. S. Paden, former sales representative for Modine retired July 31. James J. Staup, president for the new firm, was formerly sales manager for Schemenauer Mfg. Co., Holland, Ohio. Staup & Harris will represent the company's entire heating and air conditioning line. . .

Peter Chasney, Baltimore, Md., has been appointed sales representative for CORDLEY & HAYES, New York, N. Y., manufacturers of electric water dispensers. Mr. Chasney will represent the Cordley cooler line to architects, engineers, plumbing jobbers and plumbing wholesalers throughout central and northeastern Maryland. In addition, he also represents other firms in the plumbing field.

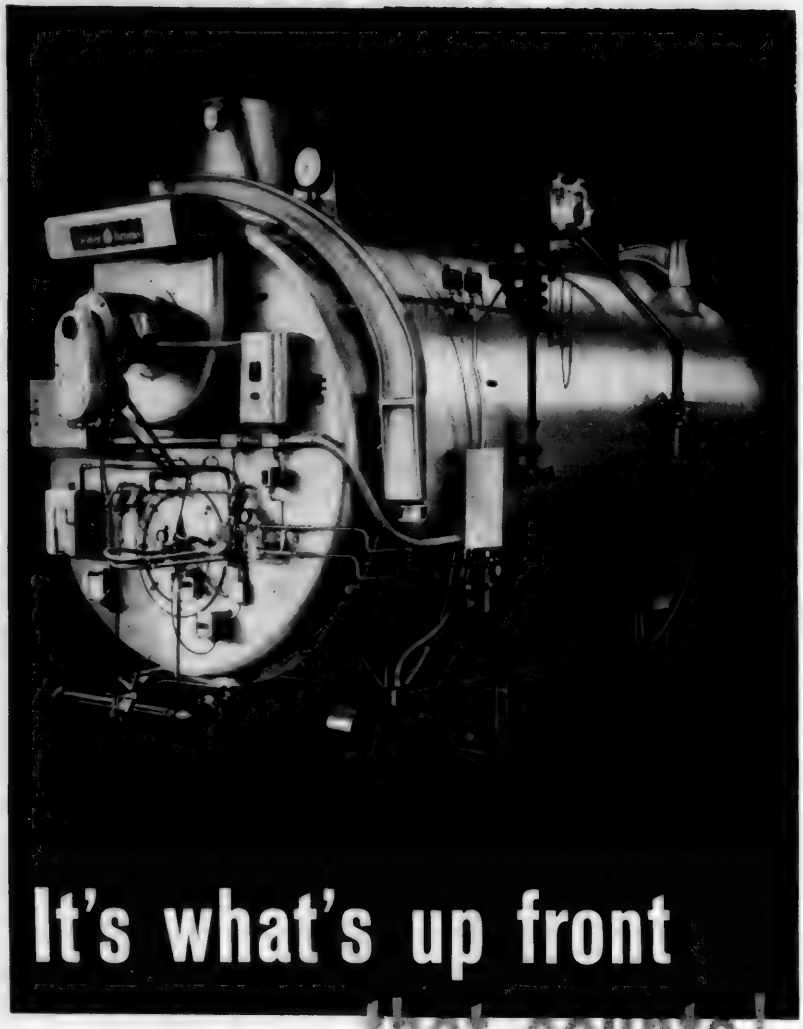
BURGEONING BUSINESS

Construction has started on an addition to the SCHEMENAUER MFG. CO. plant on Kittle Road in Holland, Ohio. The addition will practically double the manufacturing area and will be the largest of four expansions made during the past seven years. The need for expanding is the result of an intensive sales program and an increasing demand for the firm's products, the company states. Schemenauer makes classroom and auditorium unit ventilators, finned tube heating, commercial radiation, industrial heating coils and related heating and ventilating equipment. . .

Opening of branch offices in Tampa, Fla., and in Akron and Youngstown, Ohio, is announced by THE POWERS REGULATOR CO., Skokie, Ill. The Tampa office will handle contract sales of air conditioning, heating, and ventilating equipment and services only. Specialty sales of products for industrial process control and to the plumbing trade will continue to be handled by George A. Israel Company. The Ohio branches will handle sales and services, as above, plus industrial process control. . .

Formation of STRUCTA-LUNG COMPANY to manufacture industrial power roof ventilators, fans, and industrial ventilating systems was announced by Morton Simon, president. Simon, a veteran engineer and holder of many patents in the ventilator field, was formerly with Iron Lung Ventilator Co., Cleveland, as vice-president and chief engineer. The new firm has established headquarters in Willoughby, Ohio, and will manufacture and sell

cleaner
fresher
purer air
A day to remember. The sweep of sky and water . . . the fresh, clean feel of sea air. Air as clean and pure in a home? Certainly. Install Dust-magnet filters. Dust-magnets are electrostatic, *permanent* . . . rinse clean in a jiffy for immediate replacement in air conditioners and furnaces. Non-clogging, no oil coatings. As you live and *breathe* . . . install Dust-magnets!
DUST-magnet filters
3383 E. Layton Ave., Cudahy, Wisconsin
a product of STODDARD INDUSTRIES



Engineering advances in Cleaver-Brooks CB packaged boilers (15-600 hp) offer every plant engineer and boiler owner greater efficiency, simpler maintenance

1. **Controls** and control panel all mounted on front head for operator convenience.

2. **Front head hinged** (or davited) to provide quick access to flues for cleaning and inspection without disconnecting fuel or electrical lines.

3. **Quiet operation** is result of radial blade, cast aluminum blower deep in front head with acoustically treated air inlet.

4. **Rotary air damper** modulates air for high combustion efficiency. Offers vibration-free control of air for positive draft.

5. **Cam operated fuel valves** driven by rugged linkage insure accurate, easy to adjust air-fuel ratios for highest combustion efficiency.

6. **Single tip retractable nozzle** simplifies cleaning since nozzle can be completely removed from firing position without opening front head or disconnecting oil or electrical lines. Single tip burner nozzle offers close-to-ideal mixing of air and fuel.

7. **Inspirating pilot** produces and maintains a pilot at zero gas pressure.

The new CB boilers up through 600 hp with an integrally-built air atomizing burner, atomize both light and heavy oils (including No. 6 oil). Oil is burned like gas — cleanly and completely. Every CB boiler meets four design standards—*four pass—forced draft* construction — *five square feet of heating surface* per boiler horsepower — *low furnace* location. For the complete design story, write Cleaver-Brooks Company, Dept. L, 315 E. Keefe Ave., Milwaukee 12, Wis.

Cleaver Brooks®

ORIGINATOR AND LARGEST PRODUCER OF PACKAGED BOILERS

Briefly Stated

nationally a line of power ventilators and industrial fans. . .

AMERICAN MACHINE AND METALS, INC., announces that it has purchased the assets of AUTOMATIC DEVICES CO., INC. of Western Springs, Ill., except for the company's plant which it has leased. Automatic Devices develops, designs, manufactures and markets heating, cooling and air conditioning controls for residential, commercial and industrial buildings. This latest acquisition will become the Automatic Devices Division and will continue to operate at Western Springs. Henry T. Kucera will continue to manage the Western Springs operation. . .

DAVIS ENGINEERING, manufacturer of Paracoil heat transfer equipment, has opened a direct factory sales office at 7256 Touhy Ave., Chicago 48, Ill. . .

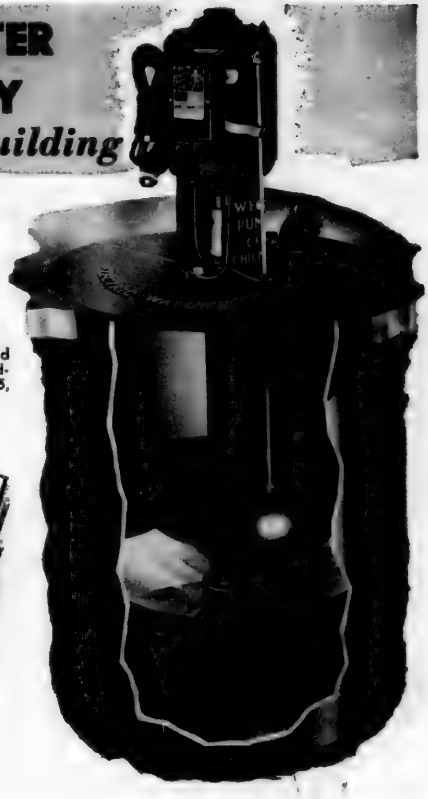
A copper and brass tube mill modernization program has been approved by the board of directors of Cerro de Pasco Corporation to be undertaken by its LEWIN-MATHES COMPANY DIVISION. Work on the project already has been initiated at the plant at Monsanto, Ill., and completion of the requisite plant changes and installation of new equipment will require approximately two years. No significant interruption in production is anticipated. The program is being undertaken for the purpose of effecting operating economies which may run as high as 20% to 25% of Lewin-Mathes' current production costs. . .

YORK DIVISION OF BORG-WARNER CORPORATION has completed establishment of twenty-four renewal parts depots to serve its engineered machinery equipment. Each depot is an independent company, functioning as a wholesaler to the trade, strategically located and adequately stocked to serve parts requirements of York Associates, independent contractors, service companies, and industrial users in their assigned territory. Depots replace the coverage and service of the former York

(Continued on page 146)

The ELECTRIC WATER BOY

Long Life Design for the better building



Public Buildings, Office Buildings and Factories require sump pumps that will provide years of dependable, trouble-free service.

When first consideration must be given to long life, low maintenance cost, simplified servicing and enduring dependability The Electric Waterboy should be specified. This pump is engineered and manufactured to the standards of heavy duty industrial drainage pumps.

Permanently lubricated extra heavy ball bearings, heavy duty shaft, a rugged float switch insure a long trouble-free life. All wearing parts may be replaced on the job providing an extra economy.

The Electric Waterboy Pumps are supplied with motors of 1/4, 1/3 and 1/2 HP. Totally enclosed or explosion-proof motors and controls can be supplied when required.

Minimum recommended sump 18" diameter. Standard pump lengths: 2, 3, 5, 6 and 8 feet.

FEATURES
- ADJUSTABLE COUPLING
- BRONZE IMPELLER
- CAPACITOR MOTOR

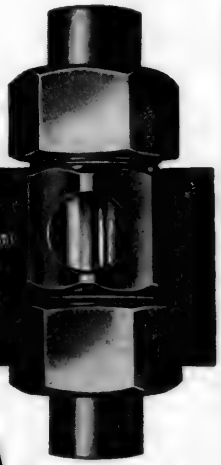
Specify and install **THE ELECTRIC WATERBOY.**

PERFORMANCE (1/4 HP 1750 RPM)						
Disch. Head (ft)	6	13	17	21	22	23
Capacity GPM	50	40	30	20	15	10

weil PUMP COMPANY

1516 No. Fremont St., Chicago

PROVED ON THOUSANDS OF PRODUCTION LINE INSTALLATIONS!



"250" SERIES

LIQUID EYE

POSITIVE SEALING INDICATORS

designed to save you even more time and money

DESIGN FEATURE

extension-gasket . . . ALL ONE-PIECE! A built-in gasket that's always in place for positive sealing and foolproof assembly.

6 sizes now available: ⅜", ½", ⅝", ⅞", 1⅛" and 1⅜" O.D.S.

The "250" has all the proved Liquid Eye advantages *plus* these newly engineered features:

- **smaller—more compact, simplified design.**
- **preformed copper extension eliminates need for separate gaskets—*foolproof* installation.**
- **complete, self-contained, economy unit.**

Write today for catalog E-57 covering the complete Allin line.

Be sure to stop at Allin Booth 226, ARI Exposition, Atlantic City, Nov. 2-5

Allin

ALLIN MANUFACTURING CO.

410 N. Hermitage Ave. • Chicago 22, Illinois

Over 1,000,000 Liquid Eyes Sold to Date!

ALL FUNCTIONAL FEATURES PLUS EYE APPEAL IN

Low Silhouette

WAUSAU AIR MOVER

- **MODERN DESIGN** — Aluminum Extrusions designed to permit low outlet velocities . . . housing completely weatherproof.
- **NO UNSIGHTLY CURB MOUNTINGS** — Point of Discharge used in design makes unsightly curb mountings unnecessary.
- **MORE RIGID WHEEL SUSPENSION** — Unique bearing arrangement places fan wheel center of gravity between the bearings provided, more rigid wheel suspension system . . . bearing wall also adds rigidity.
- **NO INLET OBSTRUCTIONS** — Air stream is free of all braces, cross members and other obstructions which produce turbulence and noise.
- **EASY ACCESS FOR SERVICING AND LUBRICATING** Bearings are accessible for easy lubricating. Bearings designed for belt drive application; totally enclosed designed for long life . . . motor (ball bearing motor and explosion proof also available).

Write for new catalog, complete details and specifications.

GREENHECK FAN & VENTILATOR CORP.

SCHOFIELD • WISCONSIN

(Continued from page 144)

district and branch warehouses that have been discontinued. Located in or near the same cities as the former warehouses, plus additional major trading areas, the new network will provide faster delivery and more personalized service, the company said.

UP ON TOP

George W. Brown was elected president and will serve as chief executive officer of WAGNER ELECTRIC CORP., St. Louis, Mo. He was also elected president of its subsidiary, Wagner Brake Company Limited of Toronto, Canada. He succeeds the late J. H. Devor. Mr. Brown came to the company as a student engineer in 1926, after graduating from the Engineering School of Ohio State University. In 1937 he was appointed personnel director. In 1952 he was promoted to executive engineer, and in 1954 was elected vice-president in charge of manufacturing, engineering, purchasing and industrial relations. He was elected director of the corporation in 1956 and executive vice-president in 1958. . .

Ronald (Bob) C. Currie has been elected vice-president and marketing manager of ORR & SEMBOWER, INC., Reading, Pa., manufacturer of packaged automatic boilers and fuel burning systems. Mr. Currie was manager of the company's Midwest District from 1948 to 1959 with offices in Cleveland and Chicago. . .

Three top executives of EMERSON ELECTRIC MFG. CO., St. Louis, Mo., were elected as advisory members of the company's Board of Directors. They are: Edward L. O'Neill, vice-president and general sales manager; William L. Davis, Jr., vice-president of engineering; and Charles G. Gulledge, vice-president of Electronics & Avionics. These three are considered as prime potential in the company's overall development program. . .

(Concluded on page 148)

FILTER EFFICIENCY *at a glance...* ANYTIME!

Dwyer

AIR FILTER GAGE

With the Dwyer Air Filter Gage you can be sure of maximum filter efficiency because you know the *exact* time to replace filters, *every time*. Gives a continuous, accurate check that spots inefficient filters, yet prevents waste through premature replacement.

The Dwyer measures filter efficiency the only practical and economical way—via pressure drop. Quickly pays for itself through savings in replacement and service time and greater operating efficiency.

Break-proof plastic construction, lifelong accuracy, simple installation, no moving parts to ever wear out or get out of adjustment. Ranges 0-½", 0-1", 0-2" and 0-3" water. A complete unit with all necessary tubing, fittings, etc.

Write for Bulletin C10

F. W. DWYER MFG. CO.

P. O. Box 373-N • MICHIGAN CITY, IND.

TODD BURNERS

OIL, GAS, OIL-GAS

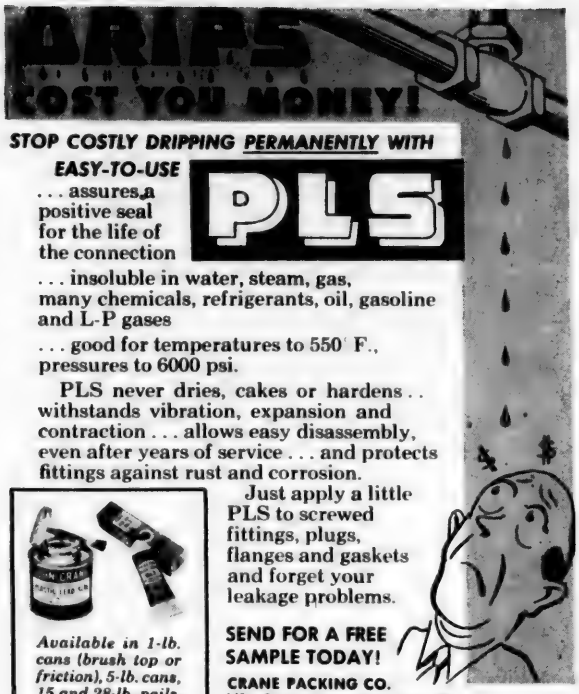
TODD

SHIPYARDS CORPORATION

PRODUCTS DIVISION

SALES AND SERVICE DEPARTMENTS
Columbia & Halleck Streets, Brooklyn 31, N. Y.

PLANT, SALES AND SERVICE
Houston, Texas



STOP COSTLY DRIPPING PERMANENTLY WITH

EASY-TO-USE

PLS

. . . assures a positive seal for the life of the connection

. . . insoluble in water, steam, gas, many chemicals, refrigerants, oil, gasoline and L-P gases

. . . good for temperatures to 550° F., pressures to 6000 psi.

PLS never dries, cakes or hardens . . withstands vibration, expansion and contraction . . . allows easy disassembly, even after years of service . . . and protects fittings against rust and corrosion.

Available in 1-lb. cans (brush top or friction), 5-lb. cans, 15 and 28-lb. pails, 85-lb. drums, also 4-oz. plastic tubes.

Just apply a little PLS to screwed fittings, plugs, flanges and gaskets and forget your leakage problems.

SEND FOR A FREE SAMPLE TODAY!

CRANE PACKING CO.
6431 Oakton St., Morton Grove, Ill. (Chicago Suburb)
In Canada: Crane Packing Co., Ltd.
Hamilton, Ont.

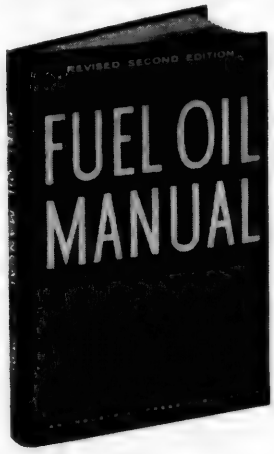
CRANE PACKING COMPANY

HARRIS
Stainless Steel
FLOATS

Write for Catalog

ARTHUR HARRIS & CO.
Established 1874

206 N. Aberdeen St.
Chicago, Ill.



Here is a book that will give you a comprehensive picture of the characteristics and uses of every type and grade of fuel oil. The author explains the meaning of each oily property, and shows how this information is applied to the selection, handling and burning of fuel oil. Impurities and how they effect combustion are described fully, and a special chapter describes fuel oil additives and how they are used. Another chapter lists troubles which may be encountered in using fuel oils, and shows the correct remedy to apply in each case. Technical language is avoided wherever possible and all terms are fully explained.

160 Pages **$4.50** 34 Tables

THE INDUSTRIAL PRESS

93 Worth Street New York 13, N. Y.

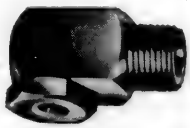
To order, circle letter K on postcard, last page.

Design... Capacity

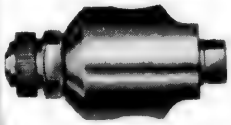
SPRAY NOZZLES

TO LOWER THE COST OF CONDITIONING AIR

• With spray nozzles from Spraying Systems you gain the advantages of DESIGN for *exact* control of spray characteristics . . . and complete range of sizes for selecting the *exact* CAPACITY needed.

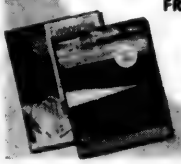


FOR WASHING—wide angle Whirljet spray nozzles. Large orifice, non-clogging with tapered inlet, no internal vanes.



FOR HUMIDIFYING—precision made Pneumatic Atomizing nozzles. Highly atomized spray vaporizes instantly and completely.

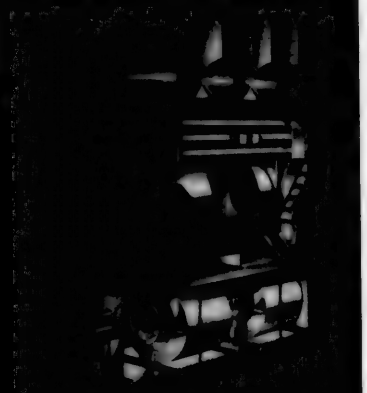
FOR COOLING—complete choice of nozzles for spray ponds, cooling towers and roof cooling. Proper distribution and atomization for efficient cooling and minimum driftage.



FREE INFORMATION—*just write for Bulletins 81 and 82.*

SPRAYING SYSTEMS CO.
3261 Randolph Street
Bellwood, Illinois

Super-Quiet



LENNOX

"OG" SERIES
INDUSTRIAL HEATER

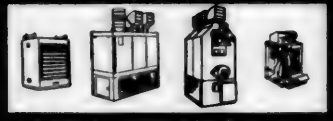
- Blower moves huge volumes of air at extremely quiet sound levels
- Rugged blower shaft design eliminates vibration problems

The "OG" blower incorporates self-aligning, permanently lubricated ball bearings. Blower motor is mounted on adjustable slide rails, and the entire section is easily accessible for service. This is just a sampling of why the "OG" is "stepping ahead" in industrial heating.

Wide Choice of Air Volume Capacities

Blower motors and pulleys are available to satisfy all air volume requirements up to 2 in. external static pressure.

LENNOX Task Matched Equipment to control and condition air for industry



64,000 to 2,000,000 Btuh Units

CLIP AND MAIL FOR FREE SPEC SHEETS

LENNOX Industries Inc.
INDUSTRIAL DIVISION
Box 1294, Dept. AC-10,
Des Moines 5, Ia.

Please send me—without obligation—complete specifications and engineering data on Lennox "OG" Series Industrial Heaters

Name_____
Company_____
Address_____ City_____
Title_____

Briefly Stated

(Concluded from page 146)

James W. Wilcock has been appointed manager of the STURTEVANT division of WESTINGHOUSE ELECTRIC CORPORATION. Specializing in air-handling products, the Sturtevant division at Hyde Park, Mass., makes fans, blowers, air washers, heating-ventilating equipment, dehumidifiers and electrostatic air cleaners. Mr. Wilcock has served as the marketing manager of the division since January, 1956. In 1958, Mr. Wilcock served as president of Air Moving and Conditioning Association, and presently is a vice-president and director of this association.

RECENT APPOINTMENTS

JOHNSON SERVICE CO., Milwaukee, Wis., announced appointment of Stephen T. Hagerman as manager of its international division. He will make his headquarters in the company's new building at 11-26 47th Ave., Long Island City, N. Y. Mr. Hagerman has specialized in the air conditioning field for the past twenty-five years, the last nineteen of which with the international division of Carrier Corporation. . .

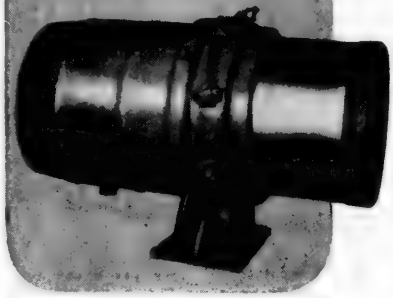
DUNHAM-BUSH, INC., announced the appointment of Frank D. Klein as product manager for air conditioning products. He was formerly chief engineer for Governair Corporation and was also associated with U. S. Airco. He will be located in the company's main office at West Hartford, Conn. Appointment of E. Harold Brown as a field sales engineer covering the Buffalo, N. Y., area was also announced. Mr. Brown will be assigned to the Cleveland district office. . .

Louis A. Muller, appointed assistant general sales manager of JENKINS BROS., valve manufacturer, will be located at the home office in New York. He joined the company in 1937 and for the past seven years has been manager of its San Francisco branch office. . .

important points about joints

- Yarway Gun-Pakt Joints are serviced *in the line under full steam pressure.*
- Costly shutdowns eliminated.
- Maintenance records show 1 manhour per year per joint.
- Fewer expansion joints needed per length of pipeline with Gun-Pakt.

YARWAY GUN-PAKT EXPANSION JOINTS

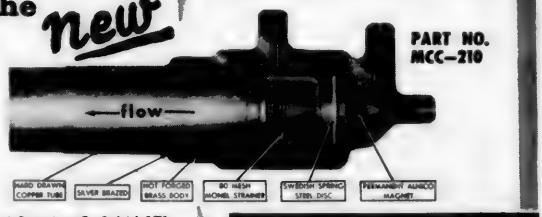


For new Yarway Expansion Joint Catalog EJ-1916 write YARNALL-WARING CO., 104 Mermaid Avenue, Phila. 18, Pa.

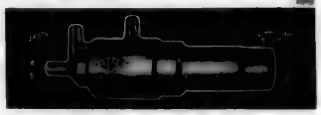
go YARWAY with confidence

WATSCO introduces the new C. C. VALVE

(Capillary Control Valve)



U.S. PAT. NO. 2,646,071



A valve specifically designed for use in reverse cycle systems. The *C. C. VALVE* is installed in conjunction with the capillaries between the high and low sides of the system, to provide single capillary restriction for the cooling cycle and double capillary restriction for the heating cycle.

The *C. C. VALVE* is applicable to all units up to and including five tons and may be used for either single or multiple capillary installations. Flow can be regulated by the size of the capillary used.

The *C. C. VALVE* replaces two ordinary check valves, thereby cutting installation time and costs in half.

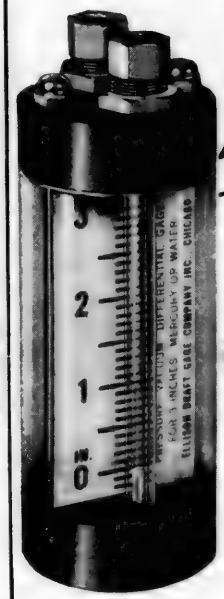
Opening sizes can be made to your specifications.

Send for Illustrated Catalog Dept. V-10

WATSCO INC.

VISIT OUR BOOTH NO. 725
ARI SHOW NOV 2-5

1020 E 15th STREET • HIALEAH, FLORIDA



ELLISON Miniature Draft Gage

HAS STAMINA, ACCURACY OF LARGE GAGES. FOR PRESSURE, VACUUM, DIFFERENTIAL READINGS

Available in ranges of 0" to 3" mercury or water, 0" to 40" of water using mercury, also 0 to 24 oz. using mercury. Dia. 2", height 5⅜", weight 9½ oz. Heavy wall glass indicating tube with straight uniform bore, protected by transparent housing. Highly visible scale. Drain plug screw on side of reservoir. Nickel plated steel fittings. Easily disassembled for thorough cleaning. Modestly priced. Should be carried in all service engineers' kits or for use wherever accurate readings are required. Send for Bulletin 217.

MODEL P-1 SINCE 1896

ELLISON DRAFT GAGE CO.

542 W. Monroe St., Chicago 6, Ill.

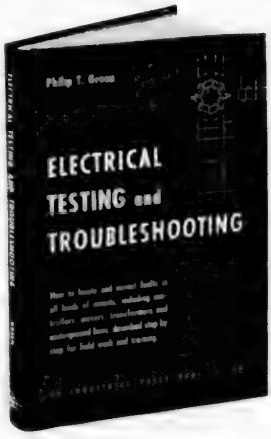
ELLISON DRAFT GAGES — The Entering Wedge To Boiler Room Efficiency

THE ELLISON LINE ALSO INCLUDES:

Draft Gages, Bell and Diafram — Inclined Draft Gages — Portable Inclined Vertical Tube Gages — Vertical Tube Gages, Oil, Heavy Liquid and Mercury, Single and Multi-Tube — U-Gages, Stationary and Portable — Air Filter Gages, Dial and Inclined Tube Types — Pitot Tubes — U-Path Steam Calorimeters — Portable Gas Analyzers, Orsat Type — Alarm Systems.

LOCATE AND CORRECT FAULTS IN CIRCUITS

Expert Describes Tested Procedures In Testing and Troubleshooting



Let an expert explain how to locate and correct faults in circuits of all kinds. Just look at the table of contents below for a listing of the topics it covers in detail. *Electrical Testing and Troubleshooting* is written in an easy-to-understand manner. Only a basic knowledge of simple arithmetic is necessary to use and comprehend the principles and procedures set forth.

All of the troubleshooting procedures described have been tested in the field, and have been proved to be great time-savers, especially for locating obscure sources of trouble. Most of these tests can be performed with the equipment isolated from the power line—current is supplied by dry cells or residual magnetism—for greatest safety.

Send for your copy today. *200 Pages, 100 Illustrations.* *$5.00.*

To order, use coupon below or circle letter G on postcard, last page.

CONTENTS

Electrical Symbols and Drawings
Analyzing and Charting Controller Operation
Troubleshooting Test Equipment
Insulation Testing
Locating Grounds
Electromagnet Windings
D-C Machine Windings
Single-Phase Transformers
Phase Sequence
Polyphase Transformers
Polyphase Induction Motors
Synchronous Machines
Power Cable Faults
Bearing Lubrication

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

Please send me ..... copies of Electrical Testing and Troubleshooting

☐ Check or money order is enclosed. Send book(s) postpaid.

☐ Send book(s) and invoice, including postage. I will pay within five days if I decide to keep the book(s).

☐ Bill me ☐ Bill company

Name .....

Company .....

Company Address .....

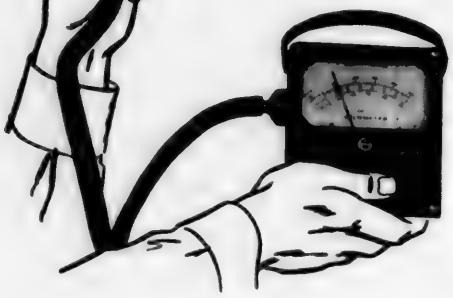
City ..... Zone .... State ....

Home Address .....

(Please fill in if you want book sent to your home) ACH&V 10/59

MEASURE

ACTUAL
AIR DELIVERY



with
Alnor®
VELOMETER

A simple, direct reading on the Alnor Velometer gives you instant measurement of actual air delivery in any distribution system. This fast, precise method eliminates the time and money wasted in trial-and-error balancing...the profit-eating call-backs so often necessary with other less precise measurements.

The Velometer is the only instantaneous, direct reading air velocity meter—accurate in all ranges, from high to low... compact, portable, easy to understand and use. Wide assortment of jets and fittings makes this precision instrument ideally suited for all air velocity measurement.

First Choice of Industry

Take the recommendation of every major manufacturer of air diffusers and leading contractors—get an Alnor Velometer. You'll save time and money on the next installation you balance.

Alnor

PRECISION INSTRUMENTS
FOR EVERY INDUSTRY

Illinois Testing Laboratories, Inc.
Room 514, 420 N. LaSalle St.
Chicago 10, Ill.

Please send Velometer Bulletin 2448-G.

Name.....

Company.....

Address.....

City.....Zone.....State.....

BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

ALUMINUM CONSTRUCTION MANUAL

There is increasing importance in the use of aluminum as a structural material, and as a result the designer is taking a second look at this material before making a decision.

As the result of a project arranged with The Polytechnic Institute of Brooklyn, allowable loads were computed for aluminum alloy 6061 which is the most widely used aluminum structural alloy. Due to this and other studies, the engineer now has available an important reference book which lists elements of sections, beam and column loads, standards and specifications.

Aluminum Construction Manual, cloth bound, 6 x 9 inches, 389 pages. Published by The Aluminum Association, 420 Lexington Ave., New York 17, N. Y. Price, $3.

• • •

TERMINOLOGY FOR AUTOMATIC CONTROLS—A proposed standard has been issued, sponsored by ASME on American Standard Terminology for Automatic Controls. ASA C85. For a copy of this 68-page report, write on your letterhead to Frank Philippbar, Standards manager, The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

PROTECTIVE MAINTENANCE OF MOTORS AND GENERATORS — A booklet has been prepared by NEMA for the use of maintenance men. Its title is Protective Maintenance of Motors and Generators. It contains standards for renewal parts, and proposed definitions and record forms. National Electrical Manufacturers Association. 155 E. 44th St., New York 17, N. Y. Price, 75 cents.

PETROLEUM REFINERY PIPING—The American Society of Mechanical Engineers has published Code ASA B31.3-1959, approved by the American Standards Association as American Standard Petroleum Refinery Piping Code. The existing code has been extensively revised and many additions made to bring it up to date. This marks the first time that this code appears separately from the rest of the American Standard Code for Pressure Piping of which it used to form a part of Section 3. The American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. Price, $4.

WRITING AND PUBLISHING YOUR TECHNICAL BOOK—Of interest to one who believes he may some day write a technical book, is a 50-page booklet which answers a number of questions that a potential author may have, and which covers the important steps of publisher contacts and other details. It contains checklists for preparing material for publication. F. W. Dodge Corp., 119 W. 40th St., New York 18, N. Y.

CLASSIFIED ADVERTISING

Sold at $12 per column inch.

MANUFACTURERS' AGENTS

An established manufacturer with 25 years experience producing ventilating equipment is looking for manufacturer's agents in many sections of the country to sell their new line of industrial fans. The products include axial flow and tubeaxial fans, both direct and belt driven, and power roof ventilators.

Please reply Box 914, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

FOR SALE

3 Ton Residential Gas Heating and Air Conditioning Combination Top National Brand new in original crates. (2) only Model RG 3 Water Cooled 3 Phase. Original Net Cost $893.00. Will sell at $475.00 F.O.B. SERVICE ENGINEERING & REFRIGERATION, 1815 Decatur Street, Ridgewood 27, New York.

PRINTED FORMS available for immediate shipment. Heating & oil burner materials form, burner service record cards, service order forms, inspection information form, survey sheet and others. Also can supply BURNER SERVICE form in 8 part EZE-SNAP with 3 carbons in each set, 1200 sets. Imprinted with your name, address and telephone, only $20.40. Send for samples—no obligation. Write Dept. AC, Degree Day Systems, 39-30 58th St., Woodside 77, N. Y.

TWO NEW BOOKS ON HOME AIR CONDITIONING

SUMMER AIR CONDITIONING by S. Konzo, J. R. Carroll and H. D. Bariether.

This basic what-how-and-why book on residential air conditioning is a training text and reference book for all who design, sell, install or operate air conditioning systems and equipment for houses and small buildings. Prepared at the request of the U. S. Armed Forces Institute, it contains problems and exercises for each chapter which help check the reader's understanding of the material.

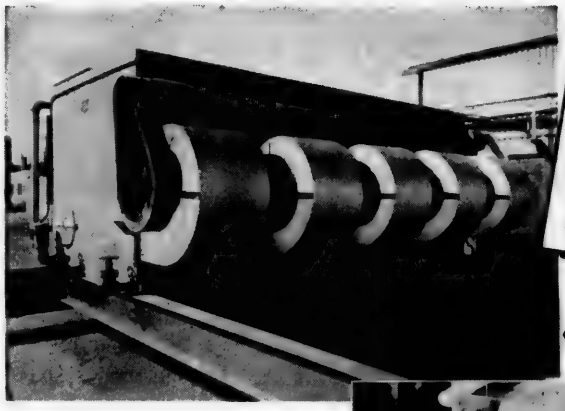
All problems can be solved by the use of simple arithmetic. All industry methods, including those recommended by engineering and trade associations, have been taken into account. A psychrometric chart is provided. 560 pages, 266 illus., **$8.00.**

WINTER AIR CONDITIONING, a companion volume by the same authors.

Presents the why and how of controlled distribution of heat and humidity in small buildings and homes. Contains a wealth of working data such as heat loss factors for various walls, design temperatures for hundreds of U. S. and Canadian cities, degree-days and how to estimate fuel consumption, etc. WINTER AIR CONDITIONING gives dealers, contractors, installers and salesmen the full background they need to be sure each furnace or boiler, ducting or piping system is tailored to the needs of individual buildings.

Similar in format to SUMMER AIR CONDITIONING, each chapter contains problems, and answers are given in the appendix. 640 pages, 300 illus., **$8.00.** SET OF BOTH, $15.00.

TO ORDER USE SPECIAL CARD OPPOSITE BACK COVER.

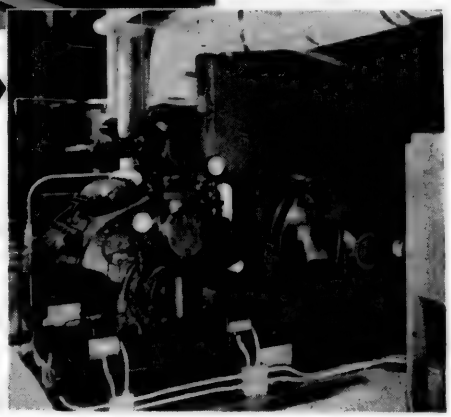


Vilter Report Card

Grade	Service Record
A	Efficient, alternating zone-load operation.
A	Exceptionally low operational cost.
A	Uninterrupted air conditioning service.
A	Smooth operation with minimum maintenance.

View of the Vilter VXF evaporative condenser located on the roof just outside the compressor room.

View of one of the two Vilter 8-cylinder VMC Freon compressors with a 100 h.p., 1175 r.p.m., part winding motor drive. These compressors are located on an upper floor, above an office.



Cool Thinking ... Cool Fun in Marquette University's Air Conditioned Brooks Memorial Union

Brooks Memorial Union is the hub of many Marquette University activities—professional meetings and conferences attracting a national audience, exciting school dances, excellent food facilities in the cafeteria, snack bar and private dining rooms. One key to its year-'round popularity and usefulness is the air conditioned comfort provided by the Vilter installation on this Milwaukee Campus.

To provide adequate air conditioning on a conservative appropriation and to minimize yearly operating expenses, the system was laid out to provide alternating zone-load cooling based on a "traffic flow" and usage pattern. During normal occupancy the entire Union is cooled. However, at peak loads only part of the conditioned space in Brooks Memorial is cooled at one time. As the peak occupancy load shifts from cafeteria and grill to the ballroom-conference room, the air conditioning is also shifted. Results of operating in this manner have been highly satisfactory.

Vilter equipment furnished on this job included two 8-cylinder VMC compressors; VXF Freon evaporative condenser; Freon liquid receiver; heat exchanger, cooling coils, motors, and controls.

"Very satisfactory performance with only routine maintenance," is the praiseworthy comment by Marquette University officials.

Let Vilter help you with your air conditioning and refrigeration requirements.

Write for these helpful bulletins to: The Vilter Manufacturing Company Dept. G-804, 2217 S. First Street, Milwaukee 7, Wisconsin

Bulletin 631 Vilter Uni-Chiller

Bulletin 820 Vilter VMC Freon Compressors

Bulletin 732 VXF—VSC Evaporative Condensers

Vilter®

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin

Air Units • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines

MODERNIZING?

Check FRICK Refrigeration FOR ALL YOUR NEEDS

- [V] CONDENSERS
- [V] PIPE COILS
- [V] SHELL-ICE MAKERS
- [V] VALVES & FITTINGS
- [V] ICE RESERVE UNITS
- [V] AIR HANDLING UNITS
- [V] SHELL & TUBE COOLERS
- [V] "ECLIPSE" COMPRESSORS
- [V] HEAVY-DUTY COMPRESSORS
- [V] QUICK-FREEZING SYSTEMS
- [V] "INSTANT" WATER COOLERS
- [V] MULTI-STAGE COMPRESSOR SYSTEMS
- [V] LOW PRESSURE REFRIGERATION UNITS
- [V] AUTOMATIC CONTROLS & DEFROSTING SYSTEMS
- [V] [V] COMPLETELY ENGINEERED SYSTEMS, DELIVERED AND INSTALLED

Frick Evaporative Condensers Save Up to 95% of the Water Used.

Frick Heavy-Duty Four Cylinder Compressors Can Be Adapted to Handle Any Type of Refrigerant.

Frick Shell-Ice—Clear Solid Pieces of Curved Ice. Made Automatically, Without Snow or Waste.

It is a proven fact that today's semi- and full-automatic equipment soon saves enough to pay for itself.

Whatever the refrigeration requirements of your plant—quick freezing, ice making, cold storage, humidity control, low temperatures, condensing, air conditioning, or any process cooling . . . Frick engineers will help you modernize your present system or design one to meet your needs.

Frick refrigeration equipment is world renowned for a long trouble-free life of dependable operation. Many Frick compressors have been in operation for over 40 years.

CALL your nearest Frick Branch or Distributor today. Or write direct to...

DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO PENNA., U. S. A.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

ASA CONFERENCE—10th National conference on Standards, at the Sheraton-Cadillac Hotel, Detroit, Mich. Secretary of the Association, 70 E. 45th St., New York 17, N. Y. . . . . **OCTOBER 20-22, 1959.**

FUELS CONFERENCE—Fuels Conference sponsored by ASME and AIME at Netherland Hilton Hotel, Cincinnati, Ohio. ASME secretary, O. B. Schier II, 29 W. 39th St., New York 18, N. Y. . . . . **OCTOBER 26-29, 1959.**

REFRIGERATION SERVICE ENGINEERS CONVENTION—Convention of the Refrigeration Service Engineers Society, at the Ambassador Hotel, Atlantic City, N. J. Secretary of the Society, 433 No. Waller Ave., Chicago, Ill. . . . . **OCTOBER 30-NOVEMBER 2, 1959.**

AIR CONDITIONING WHOLESALERS MEETING—Annual meeting of the Air-Conditioning and Refrigeration Wholesalers, in Atlantic City, N. J. Secretary, 2607 N. High St., Columbus, Ohio. . . . . **NOVEMBER 1-2, 1959.**

ARI EXPOSITION—11th Exposition of the Air-Conditioning and Refrigeration Industry at Convention Hall, Atlantic City, N. J. Geo. S. Jones, Jr., managing director of Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. . . . . **NOVEMBER 2-5, 1959.**

METAL EXPOSITION & CONGRESS—41st National Metal Exposition & Congress, sponsored by the American Society for Metals, at the International Amphitheatre, Chicago, Ill. Seward Covert & Associates, 1059 Leader Bldg., Cleveland 14, Ohio. . . . . **NOVEMBER 2-6, 1959.**

HOTEL EXPOSITION—National Hotel Exposition, New York Coliseum, New York, N. Y. . . . . **NOVEMBER 2-6, 1959.**

CONTROL CONFERENCE—National Automatic Control Conference, sponsored by ASME, IRE, AIEE ISA, Sheraton Hotel, Dallas, Tex. ASME Secretary, O. B. Schier, II, 29 W. 39th St., New York 18, N. Y. . . . . **NOVEMBER 4-6, 1959.**

CEC SEMI-ANNUAL MEETING—Consulting Engineers Council, Board of Directors semi-annual meeting, Cincinnati, Ohio (hotel to be selected). Executive Secretary, L. N. Spiller, 326 Reisch Building, Springfield, Ill. . . . . **NOVEMBER 4-7, 1959.**

COMMERCIAL KITCHEN PLANNING—Seminar on commercial kitchen planning at Michigan State University, East Lansing, Mich. Ralbern H. Murray, American Gas Association, 420 Lexington Ave., New York 17, N. Y. . . . . **NOVEMBER 9-13, 1959.**

I-B-R MEETING—Semi-annual meeting of The Institute of Boiler and Radiator Manufacturers, at the Seaview Country Club, Absecon, N. J. Secretary of the Institute, 60 E. 42nd St., New York, N. Y. . . . . **NOVEMBER 9-13, 1959.**

BRI FALL CONFERENCE—Building Research Institute Fall Conference at Shoreham Hotel, Washington, D. C. Program on November 17 devoted to new heating techniques. Harold Horowitz, Assistant Director for Technical Programs, Building Research Institute, 2101 Constitution Ave., Washington 25, D. C. . . . . **NOVEMBER 16-19, 1959.**

ASME ANNUAL MEETING—Annual meeting of the American Society of Mechanical Engineers, Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary, O. B. Schier, II, 29 W. 39th St., New York 18, N. Y. . . . . **NOVEMBER 29-DECEMBER 4, 1959.**

(Concluded on page 154)

ALPHABETICAL INDEX OF ADVERTISERS

A

A-J Manufacturing Co. ..... *
Aerofin Corp. 5
Aerovent Fan Co., Inc. ..... *
Air Devices, Inc. 115
Air Filter Corp. ..... *
Air Filter Institute ..... *
Air-Maze Corp. 138
Airtemp Div., Chrysler Corp. 59
Alco Valve Co. ..... *
Allen Cooler & Ventilator, Inc. 122
Allen, W. D., Manufacturing Co. 26-27
Allin Manufacturing Co. 145
American Brass Co. 28
American Gas Association 18-19
American Machine and Metals, Inc. ... 38
American Society of Heating Refrigerating and Air-Conditioning Engineers 121
American-Standard Industrial Div. ... 30-31
Anemostat Corp. of America 48
Armstrong Machine Works 1
Arno Adhesive Tapes, Inc. ..... *

B

Babbit Steam Specialty Co. ..... *
Barber-Colman Co. 136-137
Bell & Gossett Co. 13, 47
Bethlehem Steel Co. 38
Binks Manufacturing Co. 155
Bridgeport Brass Co. ..... *
Bryan Steam Corp. ..... *
Buensod-Stacey, Inc. 45
Buffalo Forge Co. 21
Buffalo Pumps Div., Buffalo Forge Co. *
Burt Manufacturing Co. 140
Byers, A. M., Co. ..... *

C

Cain Manufacturing Co., Inc. ..... *
Cambridge Filter Corp. 141
Carrier Corp. 42-43
Chicago Pump Co. ..... *
Chrysler Corp., Airtemp Div. 59
Clarage Fan Co. ..... Inside Back Cover
Classified Advertisements 151
Cleaver-Brooks Co., Boiler Div. 144
Construction Specialties, Inc. ..... *
Cordley & Hayes ..... *
Coyne & Delany Co. ..... *
Crane Packing Co. 147
Cyclotherm Div., National-U. S. Radiator Corp. ..... *

D

Davis Engineering Corp. ..... Insert 16A-16B
DeBothezat Fans Div., American Machine and Metals, Inc. 39
Dravo Corp. ..... *
Drayer-Hanson Div., National-U. S. Radiator Corp. ..... *
Dunham-Bush, Inc. 55
Dwyer, F. W., Manufacturing Co. 146

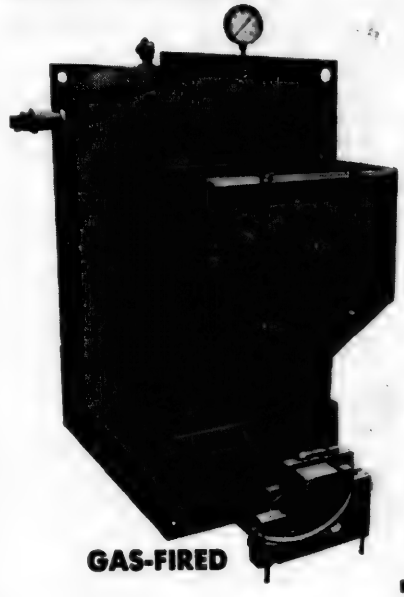
E

Edwards Engineering Corp. ..... *
Elgo Shutter & Mfg. Co. ..... *
Ellison Draft Gage Co. 149
Ewing Manufacturing Co. 114

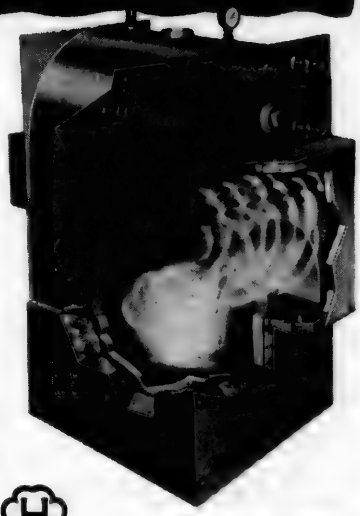
(Continued on page 155)

Portmar TWIN COIL VOLUME WATER HEATER ELIMINATES THE STORAGE TANK!

Instantaneously supplies large quantities of automatic hot water for coin operated laundries • commercial laundries • dry cleaners • apartment houses • motels restaurants • hotels • hospitals • schools factories • processing plants



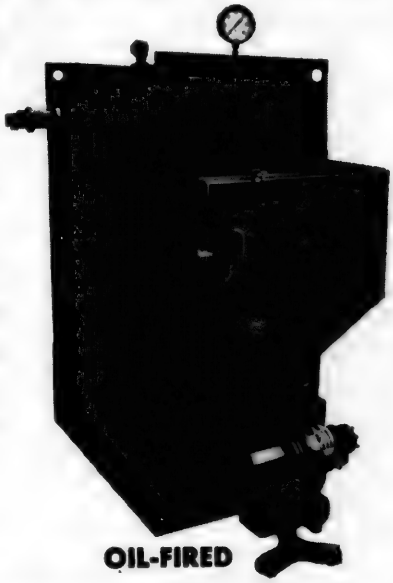
GAS-FIRED



A.S.M.E.

Cross section showing position of submerged twin copper coils.

WH SERIES — 14 Sizes
350,000 to 6,225,000 BTU per hour
Hot Water Delivery: 300 to 6,000 GPH



OIL-FIRED

- **Instant supply of sanitary hot water from twin tankless copper coils**
- **No cumbersome storage tank required**
- **Rust-free water at all times**
- **Rapid recovery rate**
- **Heavy gauge steel built to ASME Construction Code**
- **Compact water heater can be placed in limited floor space**
- **Peak efficiency and plenty of built-in reserve to meet excessive demands**
- **Supplies two temperature hot water: 140° for general use; 180° for sterilizer-rinse**
- **180° water temperature reached in a matter of minutes after weekend shutdown**
- **Complete with oil or gas burner**

PORTMAR

For complete details, write for Catalog A-49.

"Engineered Quality Steel Water Heaters"

Portmar Water Heater Company, Inc.

Division of Portmar Boiler Company, Inc.

193 Seventh Street, Brooklyn 15, N. Y. • Phone TRiangle 5-8777

RESIDENTIAL, COMMERCIAL, INDUSTRIAL WATER HEATERS AND HEATING BOILERS
VERTICAL, HORIZONTAL TUBULAR BOILERS • SCOTCH MARINE BOILERS

EXCLUSIVE
Symmons
HYDAPIPE

✦ Unifies
✦ Beautifies
✦ Simplifies

EXPOSED SHOWER INSTALLATIONS

This beautiful, one-piece brass, chrome-plated unit encloses and conceals the piping. It includes:

- **The famous SAFETY MIX, Non-scald Shower Valve, flush-mounted**
- **A one-piece, flush-mounted head bracket unit with integral stops, and ½" I.P.S. or sweat union connections**
- **Symmons "Senior" Shower Head**

All piping is enclosed in fully-chromed heavy gauge brass casing, factory assembled, ready to anchor to the wall. It is easy to install. Connection of hot and cold supplies is all that is needed with Hydapipe. Minimum maintenance and housekeeping is required.

Ask now for Hydapipe bulletin.

See SWEET'S ARCHITECTURAL FILE, DOMESTIC ENGINEERING CATALOG or write us direct for further information

Symmons
ENGINEERING COMPANY
Dept. 445 C STREET, BOSTON 10, MASSACHUSETTS

(Concluded from page 152)

WARM AIR HEATING CONVENTION—Annual convention of the National Warm Air Heating and Air Conditioning Association, at the Chase Hotel, St. Louis, Mo. G. Boeddener, managing director of the Association, 640 Engineers Bldg., Cleveland 14, Ohio. ..... **DECEMBER 1-4, 1959.**

ASHRAE MEETING—Semi-annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, and the 2nd Southwest Heating and Air-Conditioning Exposition, sponsored by ASHRAE, in Dallas, Tex. The meeting will be at the Baker and Adolphus Hotels, and the Exposition in the Memorial Auditorium. Secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **FEBRUARY 1-4, 1960.**

ISA INSTRUMENT-AUTOMATION EXHIBIT—ISA Instrument-Automation Conference and Exhibit, at the Houston Coliseum, Houston, Tex. W. H. Kushnick, executive director, Instrument Society of America, 313 Sixth Ave., Pittsburgh 22, Pa. ..... **FEBRUARY 1-5, 1960.**

FIRST NATIONAL ELECTRIC HOUSE HEATING EXPOSITION, sponsored by the National Electrical Manufacturers Association, at the Sherman Hotel, Chicago. R. D. Smith, secretary of the Association, 155 East 44th St., N. Y. 17, N. Y. .... **MARCH 21-23, 1960.**

GAMA MEETING—Annual Meeting of the Gas Appliance Manufacturers Association, at The Greenbrier, White Sulphur Springs, West Va. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. ..... **MARCH 30-APRIL 1, 1960.**

NUCLEAR CONGRESS—Sixth Nuclear Congress, sponsored by the Engineers Joint Council and the Instrument Society of America, to be held in New York City. Headquarters to be announced later. Director of Technical and Educational Services, ISA, 313 Sixth Ave., Pittsburgh 22, Pa. ..... **APRIL 3-8, 1960.**

OHI EXPOSITION AND CONVENTION—23rd National Oil Heat and Air Conditioning Exposition, at the New York Coliseum, held concurrently with the 28th annual convention of OHI, at the Park-Sheraton Hotel, New York City. Secretary, Oil Heat Institute of America, Inc., 500 Fifth Ave., New York 36, N. Y. ..... **APRIL 4-7, 1960.**

BRI SPRING CONFERENCE—Building Research Institute Spring Conference at Statler Hilton Hotel, New York, N. Y. Harold Horowitz, Assistant Director for Technical Programs, Building Research Institute, 2101 Constitution Ave., Washington 25, D. C. ..... **APRIL 19-21, 1960.**

WELDING SOCIETY MEETING—41st Annual Meeting and Welding Exposition of the American Welding Society in Los Angeles Calif. Headquarters to be announced later. A. L. Phillips, secretary of the Society, 33 W. 39th St., New York 18, N. Y. ..... **APRIL 25-29, 1960**

WESTERN EXPOSITION—Third Western Air Conditioning, Heating, Ventilating and Refrigeration Exhibit and Conference, Shrine Exposition Hall, Los Angeles, Calif. F. J. Tabery, exhibit manager, 3443 S. Hill St., Los Angeles 7, Calif. Exhibit sponsored by Western Air Conditioning Industries Association. ..... **APRIL 27-30, 1960.**

METAL EXPOSITION & CONGRESS—2nd Southwestern Metal Exposition & Congress, at State Fair Park, Automobile Building, Dallas, Tex. C. L. Wells, exposition manager, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. .... **MAY 9-13, 1960.**

ASHRAE MEETING—Annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., at Royal York Hotel, Vancouver, B. C., Canada. Secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **JUNE 13-15, 1960.**

CONGRESS ON OCCUPATIONAL HEALTH—13th International Congress on Occupational Health, first to be held in the Western Hemisphere, at the Waldorf Astoria Hotel, New York City. Dr. Leo Wade, organizing committee, 15 W. 51st St., New York 19, N. Y. ..... **JULY 25-29, 1960.**

ASTM MEETING—Annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 26-JULY 1, 1960.**

ALPHABETICAL INDEX OF ADVERTISERS

(Continued from page 153)

F

Fafnir Bearing Co. 51
Field Control Div., H. D. Conkey & Co. 53
Flexaust Co. 138
Frick Company 152

G

General Blower Co. ..... *
Governair Corp. 50
Greenheck Fan & Ventilator Corp. 145
Gustin-Bacon Manufacturing Co. 57

H

Halstead & Mitchell 111
Harris, Arthur & Co. 147
Hartzell Propeller Fan Co. 113
Heat-Timer Corp. 2
Henry Valve Co. ..... *
Hoffman Specialty Manufacturing Corp. 7
Hydrotherm, Inc. ..... *

I

Ilg Electric Ventilating Co. 9-11
Illinois Testing Laboratories, Inc. 150
Industrial Press 20, 123, 135, 139
Inland Steel Co. 133
International Boiler Works Co. ..... *
Iron Fireman Manufacturing Co. 119

J

Jenkins Bros. 58
Jenn-Air Products Co., Inc. 117
Johns-Manville 46
Johnson Service Co. ..... Back Cover

K

Kaiser, E. B., Co. 22

L

Lawler Automatic Controls, Inc. ..... *
Lennox Industries, Inc. 148

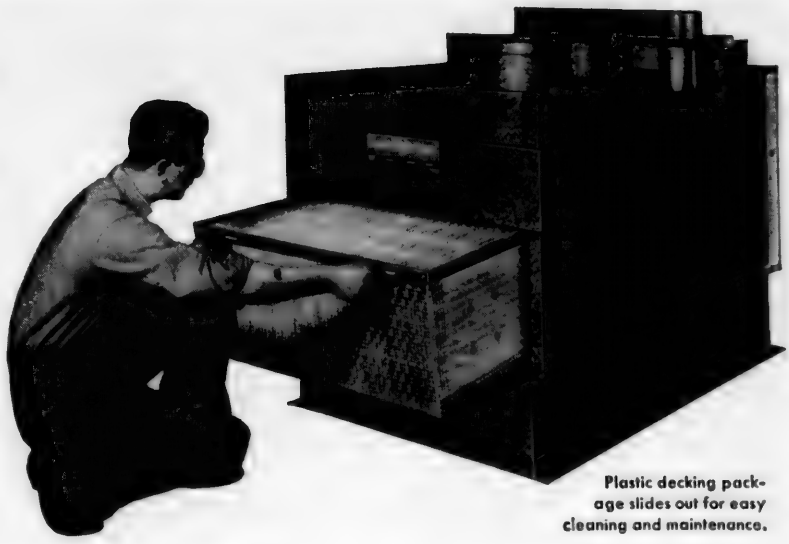
M

Magnetrol, Inc. ..... *
Marsh Instrument 32
McDonnell & Miller, Inc. 129
McQuay, Inc. 15
Mercoid Corp. ..... *
Minneapolis-Honeywell Regulator Co. 124-127

N

Nash Engineering Co. 60
National Tube Div., United States Steel Corp. 54
New York Blower Co. ..... *
Niagara Blower Co. 142
Nibco, Inc. 36-37

(Continued on page 156)



Plastic decking package slides out for easy cleaning and maintenance.

Binks new Watertemp cooling tower gives you advanced tower features at low installed cost

Binks WATERTEMP cooling tower packs high cooling efficiency into a package that makes sense in original installed cost and long-haul maintenance.

Fast, simple assembly

You need only a simple mounting foundation. Sub-assemblies need only a wrench . . . work goes fast.

Needs no paint

The only weatherproofing coating needed is already on the tower when shipped. All parts have been hot-dip galvanized after fabrication. A special galvanizing process deposits a thicker coating than established as standard by Federal and A.S.T.M. specifications.

Easy to maintain

There are no spray nozzles to clean. The plastic decking is practically indestructible . . . and the decking package slides completely out of the tower. Decking clean-up is easy and the whole tower interior is exposed for maintenance.

Economical 3 ways

Original price is low. Easy installation holds costs down, too. Maintenance takes little time.

Send for free Bulletin WT 501

See how the many WATERTEMP features let you specify big tower performance and still keep quotes down. Bulletin contains complete specifications. Get your copy from your nearest Binks Branch Office or write direct.

9216

Binks
EVERYTHING FOR WATER COOLING

VISIT BOOTH 242

11th Exposition
Air-Conditioning and Refrigeration Industry—November 2-3-4-5, 1959
Atlantic City, New Jersey

Binks Manufacturing Company
3120-38 Carroll Ave., Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

EASY OPERATION with patented SIDEWINDER manual or automatic operators
CHEVRON PACKING. No adjusting or replacing
NYLON BEARINGS Outlast bronze 5 to 1
ONE PIECE SHAFTS. Heavy duty size for true 150 lb. continuous service. Corrosion resistant.
STREAMLINED DISCS. Corrosion resistant, husky and smooth. Minimum turbulence.
INTEGRAL SEAT and BODY. Seat never needs replacing
SAVES WEIGHT and SPACE . . . smaller face-to-face dimensions
FOR 150# PSIG at 200 F

7 important features help solve valving problems

The MONOFLANGE MARK II is built for tight shut-off at 150 lbs., is ideal for throttling service, and versatile in application.

This is a Henry Pratt *Market Oriented* product . . . ALL NEW . . . built to answer industry's specific needs for this type of valve.

You will want the new MONOFLANGE MARK II Catalog. Write for your copy of bulletin 10-DA.

HENRY PRATT®

Creative Engineering for Fluid Systems

Monoflange MK-II
RUBBER SEAT BUTTERFLY VALVE

HENRY PRATT COMPANY
319 W. VAN BUREN ST., CHICAGO 7, ILL.
Representatives in Principal Cities

ALPHABETICAL INDEX OF ADVERTISERS

(Continued from page 155)

P

Peerless Electric Co. 52
Petro . . . . . *
Porter, H. K., Co., Inc. 40
Portmar Water Heater Co., Inc. 153
Powers Regulator Co. 41
Pratt, Henry, Co. 156

Q

Quickdraft Corp. 120

R

Reading Tube Corp. 25
Revere Copper & Brass, Inc. 17
Reznor Manufacturing Co. 23
Ric-Wil, Inc. 56

S

Sarco Co., Inc. . . . . *
Sarcotherm Controls, Inc. 34-35
Skidmore Corp. 49
Smith, Jay, R., Mfg. Co. 132
Spence Engineering Co., Inc. 24
Sporlan Valve Co. 29
Spraying Systems Co. 147
Sterling, Inc. 134
Stoddard Industries 143
Symmons Engineering Co. 154

T

Thermal Engineering Corp. . . . . *
Todd Shipyards Corp. 146
Trane Co. . . . . *
Tuttle & Bailey Div., Allied Thermal Corp. . . . . Insert 24A-24B

U

United States Steel Corp., National Tube Div. 54

V

Ventil-Aire Corp. . . . . *
Vibration Mountings, Inc. 142
Vilter Manufacturing Co. 151

W

Wagner Electric Corp. . . . . *
Waterloo Register Co., Inc. . . . . *
Watsco, Inc. 149
Watts Regulator Co. . . . . Inside Front Cover
Webster Electric Co. 116
Webster Engineering Co. . . . . *
Weil-McLain Co. 44
Weil Pump Co. 145
Weirton Steel Co., Div., National Steel Corp. 131
Weksler Instruments Corp. . . . . *
Western Engrg. & Mfg. Co. 118
Wheeling Steel Corp. 33
Wiremold Co. . . . . *

Y

Yarnall-Waring Co. 148

*Advertiser appeared in preceding issue

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

T & P RELIEF VALVES ..... from Watts Regulator Co. have superior features and meet new 1959 FHA requirements and ASA construction standards. Bulletin is available.
Inside Front Cover — Item 200

STEAM TRAPS FOR HEATING ..... by Armstrong Machine Works are discussed in O.F.&T. trap bulletin which explains how they work and why they should be specified. Unit heater bulletin is also offered.
Page 1 — Item 201

ZONING VALVE ..... offered by Heat-Timer has 100% shut off for positive temperature control on steam, hot and chilled water systems. New brochure containing layouts, applications, customer benefits, technical data, and prices is available.
Page 2 — Item 202

COMPLETELY AIR CONDITIONED ..... building housing the Chicago Sun-Times is the last word in comfort and efficiency. It utilizes Aerofin coils. Information is offered.
Page 5 — Item 203

RADIATOR STEAM VENTS ..... main steam vents and water vents are part of Hoffman's complete line of venting valves. This wide range is an example of the company's complete quality line of specialties. Information is offered.
Page 7 — Item 204

CONSULTING ENGINEERS ..... in nationwide survey said vibration-free operation was most important in the specification of ventilating equipment. Ilg fans and ventilators are as vibration free as it is possible to be. Literature is offered.
Pages 9-11 — Item 205

QUIET OPERATION ..... of circulating equipment is essential in forced hot water systems. Bell & Gossett booster and universal pumps provide this quiet operation. Catalog is offered.
Page 13 — Item 206

STANDARD COILS-CUSTOM COILS ... to meet any requirement and any design load are available from McQuay, Inc. They can be made of any required or desired metal or combination of metals. Information is offered.
Page 15 — Item 207

HIGH TEMPERATURE WATER ..... can be used directly in a No. 6 oil heater with no danger of system contamination by means of the Paracoil "Thermo-film" heater. Other Davis fuel oil heating equipment is offered. Use postcard in ad for specific information.
Insert 16A-16B — Item 208

STORAGE WATER HEATER ..... showed no sign of wear or corrosion after 26 years of operation. Credit Revere copper lining for this outstanding performance. Information is available.
Page 17 — Item 209

AIRPORT COOLING SYSTEM ..... which is the world's largest uses gas-operated Carrier absorption refrigeration. Seasonally idle boilers are put on year-round paying basis. Information offered.
Pages 18-19 — Item 210

VENTILATION FOR PROBLEM AREAS .. is solved in a practical manner by Buffalo Sky-Vent power roof ventilators. Another of the company's ventilating packages is its make-up air unit. Two bulletins are offered.
Page 21 — Item 211

UNDERGROUND SYSTEMS ..... for heat distribution are a specialty of E. B. Kaiser Co. Hints on specifying Ebko piping systems are detailed in advertisement. A 24-page catalog for designing and specifying underground heat distribution systems is offered.
Page 22 — Item 212

UNIT HEATERS ..... manufactured by Reznor are demanded by tough buyers. These heaters have a record of only one-tenth of one per cent factory replacement in 70 years. Information is available.
Page 23 — Item 213

AUTOMATIC REGULATING VALVES ... can have a costly down-time. Ad, by Spence Engineering Co., Inc., gives three tips for low maintenance of these valves. More information is offered in a bulletin which is available.
Page 24 — Item 214

EXTRUDED ALUMINUM GRILLES ..... from Tuttle & Bailey feature trim, attractive straight-line styling. For supply or return portions of heating, cooling or ventilating systems they are suited for ceiling, side wall, floor or sill installation. Information is offered.
Insert 24A-24B — Item 215

COPPER TUBING LINE ..... available from Reading Tube includes: Lektroneal copper tube; Lektroseal copper refrigeration tube; Readi-Fin finned copper tube; and Mackenzie Walton precision copper tube. Also commercial copper tube, red brass and copper pipe. Information is available.
Page 25 — Item 216

NEW FIRE HOSE CABINET ..... by W. D. Allen has foul-proof door rack. Rack swings a full 180 deg. and never fouls hose line. Choice of sizes and styles for every requirement. Firecheck book offered, shows basic requirements for fire protection system.
Pages 26-27 — Item 217

LONGER LENGTHS ..... of copper tube mean fewer joints. Anaconda copper tube for sanitary drainage systems comes in standard 20-ft lengths. Information is available.
Page 28 — Item 218

CONSTANT LIQUID LEVELS ..... can be maintained for all flooded systems with the Sporlan LMC control. It provides modulated flow action, not on or off. Bulletin is offered.
Page 29 — Item 219

SELECT AIR CONDITIONING ..... heating and ventilating equipment by the package instead of the piece and get a more integrated system. So states American-Standard Industrial Division in this month's ad. Information is available.
Pages 30-31 — Item 220

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

DIAL THERMOMETERS ..... are offered in new and complete line by Marsh Instrument Co. for piping and duct work. For use on heating and cooling equipment, air ducts, vessels, kilns, ovens, etc. Bulletin tells the whole story.
Page 32 Item 221

GALVANIZED STEEL SHEETS ..... from Wheeling Steel Corp. will not flake or peel. Anything that can be made of steel sheets can be made of this product. Information is available.
Page 33 Item 222

WELDING FITTINGS ..... from Nibco take the turns with strength to spare. A Husky 4-inch elbow has more than 8 times as much strength as needed. Catalog and prices are offered.
Page 36 Item 223

UNIFORM QUALITY ..... is the watchword at Nibco's new automatic foundry. That is why the company's red brass castings are the most uniform copper tube fittings in the entire plumbing industry. Catalogs are offered.
Page 37 Item 224

A PROTECTIVE HOUSING ..... shields a DeBothezat Bifurcator motor from contact with hot and corrosive fumes. The result: smoother operation and lowered motor maintenance cost. Information is offered.
Page 39 Item 225

FISHMOUTHS SAVE 50% ..... or more over commercially available branch fittings. Made by H. K. Porter, they are available for branch connections 2 inches or over and are made from Schedule 40 pipe. Complete information, prices, and names of distributors available.
Page 40 Item 226

AIR CONDITIONING CONTROL ..... by Powers at the new Aqueduct Racetrack, L. I., N. Y., pays off in greater comfort, increased attendance and income. Information on pneumatic control system is available.
Page 41 Item 227

ROOF-TOP WEATHERMAKER ..... offered by Carrier for flat roof, one story buildings, puts both heating and cooling outdoors. Occupies no valuable floor space, uses only a minimum of duct work. Available in 7.5 and 10-ton capacities. Information is available.
Pages 42-43 Item 228

CAST IRON GAS BOILERS ..... from Weil-McLain are the modern boilers for modern schools. Two are used in the new Oak Park School, Laurel, Miss. Information is offered.
Page 44 Item 229

DUAL DUCT SYSTEM ..... from Buensod-Stacey permits balancing a building before it's built. Air mixing units can be pre-set at the factory for desired volume and guaranteed within plus or minus 5%. Information offered.
Page 45 Item 230

TRANSITE VENT PIPE ..... produced by Johns-Manville is made of asbestos-cement; retains its original, attractive appearance, and saves on upkeep because it resists the attack of most gases, mists, fumes, and dusts. Information is available.
Page 46 Item 231

COMPRESSOR SERVICE ..... is seldom needed on Bell & Gossett units but when it is, all the parts needed can be carried in two hands. Two parts will handle 95% of all repair problems. Information is available.
Page 47 Item 232

PERFECT AIR DIFFUSION ..... for electronic computers is provided by Anemostat air diffusers. High heat return from equipment and lighting is efficiently controlled. Selection manual is offered.
Page 48 Item 233

HEATING PUMPS ..... available from Skidmore are built for performance. A unit is designed for each and every heating requirement. Included are an easily accessible, compactly designed condensation pump and a close-coupled, mechanical shaft-seal vertical pump. Bulletins available.
Page 49 Item 234

AIR CONDITIONING EQUIPMENT ..... from Governair Corp. is "satisfabricated" to suit your requirements. Ad describes 422 reasons why this is so. Information on any specific unit listed is available.
Page 50 Item 235

BALL BEARINGS SIMPLIFY DESIGN ... and assembly for Frick Co. of fan shaft bearings for air cooling unit and evaporative condensers. Fafnir bearings provide positive protection against moisture. Information is available.
Page 51 Item 236

FAN AND BLOWER UNITS ..... from Peerless Electric go through a cleaning and painting procedure that is one of the most important protective operations in the manufacturing process. Catalogs are available.
Page 52 Item 237

THE CONTROL OF DRAFT ..... is fully covered in technical brochures which are available from Field Control. A specification guide and a handbook and installation guide are offered.
Page 53 Item 238

STEEL PIPE ..... produced by National Tube Div., United States Steel, has the advantage of a distributor service which guarantees immediate delivery, a single, complete source of steel tubular materials, and valuable engineering and technical assistance. Information is available.
Page 54 Item 239

THE AIR CONDITIONING ..... at Goddard Hospital, Brockton, Mass., utilizes Dunham-Bush equipment and needs no nursing. In addition it is a complete system with one-source, one responsibility. Information is available.
Page 55 Item 240

PREFABRICATED INSULATED PIPING .. from Ric-wiL was specified and installed for the underground piping system at award-winning Linton High School. Information is available.
Page 56 Item 241

DUCT INSULATION ..... from Gustin-Bacon is the only duct insulation made exclusively of long, textile-type glass fiber. Those that compare efficiency, permanence and applied costs choose it. Information is available.
Page 57 Item 242

WHERE DEPENDABILITY ..... of pipe lines is a must, as at world-famous Merck Sharp & Dohme, control is entrusted to Jenkins valves. Information is available.
Page 58 Item 243

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. All advertisements are digested here except those that are received too late for inclusion in this listing.

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

PACKAGED AIR CONDITIONING ..... by Chrysler Airtemp is specified for the many engineering exclusives it offers: compressor that cuts operating and maintenance costs; over 300 air conditioner models to choose from; and safety features usually not offered, even as extras. Information is available.
Page 59 Item 244

FIN SPACING YOU WANT ..... is offered with Halstead & Mitchell's coils, which are suitable for use with most refrigerants, steam, hot or chilled water. Information is available.
Page 111 Item 245

BAD VENTILATION ..... is seldom the sole cause of a labor dispute but it is often a contributing factor. Hartzell's complete line includes the equipment you need to insure effective ventilation. Information is available.
Page 113 Item 246

HOT WATER HEATER ..... of the automatic, commercial type is offered by Ewing Mfg. Co. It is called the low cost answer to the hot water problem for laundries, restaurants, motels, schools and apartments. Information is available.
Page 114 Item 247

SLOT-TYPE DIFFUSERS ..... sold by Air Devices, Inc., guarantees greatest possible uniformity of air flow while enhancing modern architectural design. One mile of Stripline diffusers installed in Int'l Minerals & Chemical Corp.'s Administrative and Research Center, Skokie, Ill. Stripline catalog offered.
Page 115 Item 248

FUEL OIL HANDLING ..... equipment from Webster Electric provides a complete line for all commercial and industrial applications from tank to burner. Three bulletins are offered.
Page 116 Item 249

VIBRATION ISOLATORS ..... on Jenn-Air power exhausters are guaranteed for life. It is the key to quiet operation and long exhauster life. Bulletin is offered.
Page 117 Item 250

AXIAL ROOF VENTILATORS ..... by Western Engineering & Mfg. Co. are offered in two new models shown in ad: A low silhouette hooded exhaust unit and a low silhouette vertical exhaust ventilator. Information is available.
Page 118 Item 251

STEAM HEATING METHOD ..... developed by Iron Fireman is praised by prominent research firm using the system. Features include individual room temperature control and low maintenance cost. Information is available.
Page 119 Item 252

POWER DRAFT UNIT ..... for industrial, residential and institutional exhausting, is available from Quickdraft. It increases heating and combustion efficiency with no motors, fans or bearings in exhaust lines. Engineering data are offered.
Page 120 Item 253

TWO ROOF VENTILATORS ..... from Allen Cooler & Ventilator Co. are widely used for the engineered ventilation of modern structures, including industrial uses. Catalog and specifications are offered.
Page 122 Item 254

ELECTRONIC AIR CLEANER ..... from Minneapolis-Honeywell offers flutter-jet washing. It removes 95% of all airborne dirt. Information is offered.
Insert bet. 124-128 Item 255

A MASTER CONTROL ..... for your central fan system is the new Honeywell transistorized control which combines the best of electronics and pneumatics. Wide choice of specialized sensing elements is offered. Information is available.
Insert bet. 124-128 Item 256

LOW WATER CUT-OFFS ..... should be installed on hot water space heating boilers, according to engineers, contractors and manufacturers. McDonnell & Miller always knew it was a good idea and have the controls. Bulletin is offered.
Page 129 Item 257

BOOKLET ON ZINC-COATED STEEL ... published by Weirton Steel contains 12 pages that explain in detail how Weirkote can help you. It goes through the most tortuous jobs in the shop and never chips or flakes.
Page 131 Item 258

STOP WATER HAMMER ..... and control hydrostatic shock with Jay R. Smith's hydrostatic shock control. Designed to last the life of the piping system without failure, unit is available in six sizes. Booklet is available.
Page 132 Item 259

STEEL SHEET WON'T FLAKE ..... which fact is proven, as illustrated in ad, by a powerful paving breaker hitting a sample sheet laid on the ground with 75,000 ft-lb of developed energy. Information available from Inland Steel.
Page 133 Item 260

ROOM TEMPERATURE CONTROL ..... from Sterling, Inc., for all types of buildings provides accurate and independent control on steam or hot water systems. A modulating control, it is completely self contained, has no electrical connections. Information is available.
Page 134 Item 261

SIDEWALL DIFFUSER SELECTION ..... is discussed in this ad by Barber-Colman Co. The company's diffusers and accessories are covered in an engineering data catalog which is available.
Pages 136-137 Item 262

FLEXIBLE HOSE ..... from The Flexaust Co. is adaptable for all kinds of fume and dust control and ventilation uses. It is durable, lightweight, and easy to install. Details are available.
Page 138 Item 263

FOR AIR CLEANING ..... that is dependable and low in cost, manufacturer suggests you specify Air-Maze filter panels, rotating panel curtains, or electronic air cleaners. All-line catalog is offered.
Page 138 Item 264

REVERSE VENTILATION ..... may be the answer to your ventilation problems, company suggests. Burt's low type ventilators supply and exhaust air, blow down fresh air to blanket floor area at ALCOA's Lancaster, Pa., plant. Data book is offered.
Page 140 Item 265

HIGH EFFICIENCY FILTER ..... from Cambridge Filter Corp. is reliable and offers positive filtration, low pressure drop and easy installation and maintenance. Bulletin is available.
Page 141 Item 266

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

DRY AND CLEAN AIR ..... at the right temperature is a product of the Niagara method of air conditioning using Hygrol liquid absorbent. Two bulletins are offered.
Page 142 Item 267

VIBRATION MOUNTINGS ..... made of neoprene-in-shear reduce noise and absorb vibration in fans, pumps, and air conditioning equipment. Vibration Mountings, Inc., offers engineering data sheet.
Page 142 Item 268

THE FRESH FEEL OF SEA AIR ..... can be duplicated in a home by use of electrostatic, permanent Dust-magnet filters. They rinse clean in a jiffy for immediate replacement. Information is available.
Page 143 Item 269

IN BOILERS ..... as in cigarettes, it's what's up front that counts. Engineering advances in Cleaver-Brooks packaged boilers offer greater efficiency and simpler maintenance. Information is available.
Page 144 Item 270

SUMP PUMPS ..... for public buildings, office buildings and factories should provide years of dependable, trouble-free service. Weil's Electric Waterboy is such a pump. Information is available.
Page 145 Item 271

LOW SILHOUETTE AIR MOVER ..... is offered by Greenheck Fan & Ventilator Corp. Low velocities. Weatherproof housing. No unsightly curb mountings. New catalog has details, specifications.
Page 145 Item 272

POSITIVE SEALING INDICATORS ..... made by Allin Mfg. Co. proven on thousands of production line installations have one piece extension gasket for positive sealing and fool-proof assembly. Six sizes. Complete line catalog available.
Page 145 Item 273

OIL BURNERS ..... plus burners for gas and oil-gas are offered by Todd Shipyards Corp. They have low installation and maintenance cost, yet many years of dependable service. Information is available.
Page 146 Item 274

AIR FILTER GAGE ..... from F. W. Dwyer Mfg. Co. tells you exactly when to replace filters, assuring maximum filter efficiency. Gives a continuous, accurate check that spots inefficient filters, yet prevents waste through premature replacement. Bulletin describes the gage.
Page 146 Item 275

DRIPS COST MONEY ..... but they can be stopped permanently with packing from Crane Packing Co. It is good for temperatures to 550 deg F, pressures to 6000 psi. Free sample and information are available.
Page 147 Item 276

STAINLESS STEEL FLOATS ..... from Arthur Harris & Co. are designed for high pressure, high temperature, and corrosion resistance. Catalog describes them.
Page 147 Item 277

SPRAY NOZZLES ..... from Spraying Systems Co. lower the cost of conditioning air because the company designs them for exact control of spray characteristics and offers them in a complete range of sizes for selecting the exact capacity needed. Two bulletins give all the details.
Page 147 Item 278

INDUSTRIAL HEATER ..... from Lennox Industries, Inc. is called super-quiet. Blower moves huge volumes of air at extremely quiet sound levels. Engineering data are offered.
Page 148 Item 279

EXPANSION JOINTS ..... from Yarnall-Waring Co. may be serviced in the line under full steam pressure. Costly shutdowns are eliminated. Catalog is available.
Page 148 Item 280

CAPILLARY CONTROL VALVE ..... specifically designed for use in reverse cycle systems is introduced by Watsco, Inc. Valve is applicable to all units up to and including 5 tons. Catalog is offered.
Page 149 Item 281

MINIATURE DRAFT GAGE ..... from Ellison has the stamina and accuracy of large gages. For pressure, vacuum, or differential readings. Bulletin is offered.
Page 149 Item 282

DIRECT READING VELOMETER ..... measures actual air delivery. Simple, direct reading gives instant measurement in any distribution system. Alnor velometer is portable, easy to understand and to use. Bulletin is available.
Page 150 Item 283

COOL THINKING, COOL FUN ..... are offered in Marquette University's air conditioned Brooks Memorial Union through use of equipment from The Vilter Mfg. Co. Literature is available.
Page 151 Item 284

REFRIGERATION EQUIPMENT ..... from Frick Co. is world renowned for a long, trouble-free life of dependable operation in any refrigeration service. Information is available.
Page 152 Item 285

VOLUME WATER HEATER ..... from Portmar eliminates the storage tank. An instant supply of sanitary hot water is available from twin tankless copper coils. Catalog is offered.
Page 153 Item 286

NON-SCALD SHOWER VALVE ..... from Symmons Engineering Co. is part of Hydapipe system for exposed shower installations. System simplifies and beautifies. Literature is available.
Page 154 Item 287

NEW COOLING TOWER ..... from Binks Mfg. Co. gives advanced tower features at low installed cost. It is easy to assemble, easy to maintain. Bulletin is offered.
Page 155 Item 288

SEVEN IMPORTANT FEATURES ..... of the rubber seat butterfly valve from Henry Pratt Co. help solve valving problems. Bulletin describes the valve.
Page 156 Item 289

AIRFOIL FAN ..... from Clarage Fan Co. tops all others where it counts—on the job. It is perfected for mechanical draft and heavy duty applications. Catalog is available.
Inside Back Cover Item 290

WATER VALVES ..... for small room air conditioning units are specially designed for accurate, trouble-free control of hot and chilled water. These compact valves, from Johnson Service Co., are described in three bulletins.
Back Cover Item 291

CIRCLE FOR NEW EQUIPMENT AND LITERATURE INQUIRIES

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110

CIRCLE FOR AD-DIGEST INQUIRIES

200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309

PLEASE PRINT CLEARLY

Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....**Zone** ....**State** .....

TO ORDER BOOKS DESCRIBED BELOW

Please send and bill me for the books circled: October '59

A B C D E F G H I J K L M N O P Q R S T U V

FIRST CLASS
PERMIT NO. 53
NEW YORK, N. Y.

BUSINESS REPLY MAIL
NO POSTAGE NECESSARY IF MAILED IN UNITED STATES

POSTAGE WILL BE PAID BY

AIR CONDITIONING, HEATING and VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

READERS SERVICE DEPT.

This service is not available to overseas readers. Cards are void after January 1, 1960.

BOOKS TO HELP YOU WITH YOUR DESIGN PROBLEMS

DESIGN OF AIR CONDITIONING SYSTEMS
by F. W. Hutchinson

115 full-page charts solve problems of air conditioning system design involving cooling load, duct design, psychrometrics, solar energy, comfort conditioning, panel cooling, etc. For each chart the engineering and mathematical background plus design example and solution are given. **336 Pages, 118 Illus., $7.00.**

TO ORDER CIRCLE **B** ON CARD ABOVE

DESIGN OF HEATING AND VENTILATING SYSTEMS by F. W. Hutchinson

96 full-page charts solve problems of heating and ventilating involving load determination, duct design, panel heating, solar heating and combustion analysis. Companion book to Design of Air Conditioning Systems. Same methods to explain and solve problems are used. **320 Pages, 96 Charts, $7.00.**

TO ORDER CIRCLE **C** ON CARD ABOVE

COMBINATION OFFER

Both of the above books by Prof. F. W. Hutchinson, $12.50.

TO ORDER CIRCLE **D** ON CARD ABOVE

IT'S EASY TO GET THE BOOKS YOU NEED

Just circle the appropriate letters on one of the cards above and drop it in the mail. We'll ship the books and bill you. Or you can save book postage if you send payment with your order. Either way, you have full return privileges if not satisfied.

HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING
Edited by Clifford Strock

Completely new book containing thousands of facts, figures, data and principles; hundreds of charts, tables and maps. Answers problems you face every day in your work. Subjects treated thoroughly include: Air Conditioning, Air Handling, Building Heat Loss, Climatic Data, Combustion, Degree-Days, Dual Duct Design, Dust Collection, Fuel Estimating, High Velocity Air, Mathematics, Motors, Piping and Plumbing, Psychrometry, Radiator Heating, Refrigerants, Service Hot Water, Solar Data, Steam Flow, Ventilation, Warm Air Heating, Terminology and a complete cross index. **1094 Pages, 7¾" x 10¾", 598 Charts, Maps, Illus., 518 Tables, $15.00.**

TO ORDER CIRCLE **L** ON CARD ABOVE

SUMMER AIR CONDITIONING
by S. Konzo, J. R. Carroll and H. D. Bareither

Training text and reference book on residential air conditioning for all who design, sell, install or operate these systems. Diagrams show mechanisms and principles of operation. Information understandable to beginner. Tells *how* and *why* things are done the way they are and *what* makes equipment operate the way it does. **560 Pages, 266 Illus., $8.00.**

TO ORDER CIRCLE **T** ON CARD ABOVE

WINTER AIR CONDITIONING
by S. Konzo, J. R. Carroll and H. D. Bareither

Does for heating what *Summer Air Conditioning* does for cooling. **640 Pages, 317 Illus., $8.00.**

TO ORDER CIRCLE **U** ON CARD ABOVE

COMBINATION OFFER

Both of the above Air Conditioning books, $15.00.

TO ORDER CIRCLE **V** ON CARD ABOVE

MORE BOOKS LISTED ON OTHER SIDE→

FIRST CLASS
PERMIT NO. 53
NEW YORK, N. Y.

This service is not available to overseas readers. Cards are void after January 1, 1960.

BUSINESS REPLY MAIL
NO POSTAGE NECESSARY IF MAILED IN UNITED STATES

POSTAGE WILL BE PAID BY

AIR CONDITIONING, HEATING and VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

READERS SERVICE DEPT.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309

CIRCLE FOR NEW EQUIPMENT AND LITERATURE INQUIRIES

CIRCLE FOR AD-DIGEST INQUIRIES

Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....**Zone** ....**State** .....

PLEASE PRINT CLEARLY

Please send and bill me for the books circled: October '59

A B C D E F G H I J K L M N O P Q R S T U V

TO ORDER BOOKS DESCRIBED BELOW

USE CONVENIENT CARD ABOVE TO ORDER THESE BOOKS

HIGH TEMPERATURE WATER SYSTEMS
by Owen S. Lieberg

A complete and concise exposition of the principles, design, installation and application of high temperature water. Written by the designer of many of the world's largest systems. For engineers, operators, and owners. **224 Pages, 109 Illus., $6.50**

TO ORDER CIRCLE **M** ON CARD ABOVE

METHODS OF JOINING PIPE by J. E. York

The most detailed information available on standards and special joints for all types of metallic, glass, tile, plastic and concrete pipe. Data on joints designed to take up movement due to expansion and contraction. **236 Pages, 249 Illus., $4.00.**

TO ORDER CIRCLE **O** ON CARD ABOVE

DESIGN OF INDUSTRIAL EXHAUST SYSTEMS
Completely revised 3rd Edition
by John L. Alden

This classic text on how to design, build and buy industrial exhaust systems has been brought up-to-date to meet modern standards of industrial environment. Developments and advances in devices and techniques described. **25 Pages, 137 Illus., $6.00.**

TO ORDER CIRCLE **E** ON CARD ABOVE

DESIGN OF PLUMBING AND DRAINAGE SYSTEMS by L. Blendermann

Detailed, illustrated guide covering modern plumbing practice and design. Basic problems as well as modern specialized topics are discussed. **328 Pages, 201 Illus., $7.00.**

TO ORDER CIRCLE **F** ON CARD ABOVE

FLUID FLOW IN PIPES by C. H. McClain

How to solve problems involving the flow of liquids and gases through pipes. How to handle viscosity, friction, heat, and other factors expressed in various dimensional systems. Worked-out problems show applications of principles. **124 Pages, 18 Illus., $4.00.**

TO ORDER CIRCLE **J** ON CARD ABOVE

PLANT AND PROCESS VENTILATION
by W. C. L. Hemeon

Design factors and data that can be applied to any situation. Principles are clear, logical. Shows how to estimate exhaust characteristics of any cold, multi-directional process; and obtain exhaust requirements for such a situation. **448 Pages, 172 Illus., $9.00.**

TO ORDER CIRCLE **Q** ON CARD ABOVE

INDUSTRIAL HEAT TRANSFER
by F. W. Hutchinson

Provides 123 time-saving working graphs for the direct solution of most commonly encountered problems. Graphs are equal in accuracy to the equations from which they are derived and help eliminate errors in calculation. **336 Pages, 136 Charts and Illus., $7.00.**

TO ORDER CIRCLE **N** ON CARD ABOVE

SNOW MELTING by T. Napier Adlam

Correct, tested steps in planning, designing, building and operating snow melting systems. Time saving charts, tables and graphs give data and simplify every step. **224 Pages, 189 Illus., $4.50.**

TO ORDER CIRCLE **S** ON CARD ABOVE

FLOW AND FAN by C. H. Berry

Covers the *flow* of gas through ducts, and *fan* performance and control; moving air through ducts, fan selection and control, duct arrangement, system characteristics, flow analysis. Basic data and methods used to calculate system resistance. Practical information for selecting a fan for any duty. **232 Pages, 84 Illus., $4.00.**

TO ORDER CIRCLE **I** ON CARD ABOVE

This is for YOU!

Shows you why Clarage's airfoil fan tops all others where it counts...on-the-job

Stable high efficiency where it counts — under actual operating conditions.

That's what you *get* (not just expect to get) with the Clarage Type AF Dynafoil Fan...perfected for mechanical draft and heavy-duty applications such as industrial processes, conduit type air conditioning, tunnel ventilation.

Contact our nearest sales engineering office or request catalog on coupon at right.

Clarage Fan Company
Kalamazoo, Michigan

Please send me Catalog 859 describing Clarage Dynafoil Fans.

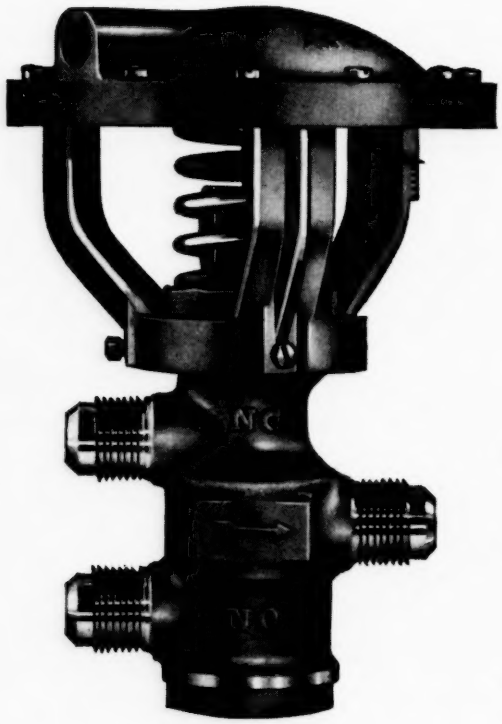
Name_____

Firm_____

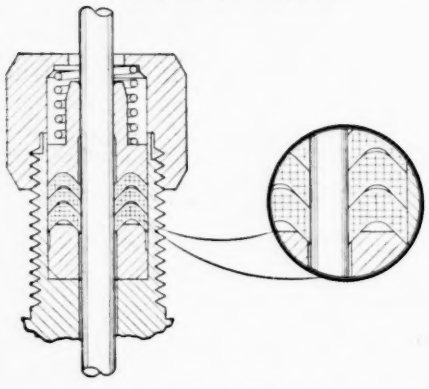
Address_____

City_____ State_____

JOHNSON WATER VALVES
FOR SMALL ROOM AIR CONDITIONING UNITS



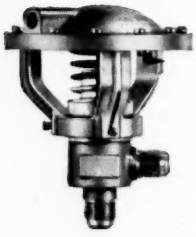
V-154 Three-Way Mixing Valve
(Inner Valve — Flat Disc)



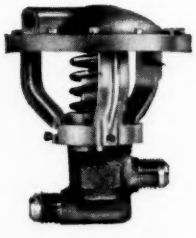
Valve Packing Detail

- Specially designed for accurate, trouble-free control of hot and chilled water in unit air conditioners. Compact, easily installed in confined spaces.
- Special V-ring, self-sealing packing:
  - **a.** Utilizes the force of the water pressure to effect a positive seal. Always has the right packing gland pressure to prevent leakage.
  - **b.** Requires no initial manual adjustment.
  - **c.** Automatically compensates for wear, eliminates need for servicing.
  - **d.** Minimizes friction because sealing force is proportional to fluid pressure.
  - **e.** Automatically compensates for changes in water temperature.
- Long-wearing, resilient molded rubber diaphragm. Diaphragm top can be removed without disturbing balance of assembly.
- Adjustable spring range permits synchronization of operation of valves in several units when controlled by a single thermostat. Special spring construction eliminates spring set and fatigue.
- ½" O.D. S.A.E. flare connections fit tubing employed with unit. No special pipe to tubing adapters required.

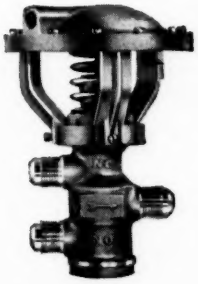
Full details are contained in Bulletin Nos. V-152, V-154, and V-164. Write Johnson Service Company, Milwaukee 1, Wisconsin.



V-152
ANGLE VALVE



V-152
OFFSET GLOBE VALVE



V-164
THREE-WAY MIXING VALVE
(Inner Valve-Modulating Plug)

JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885